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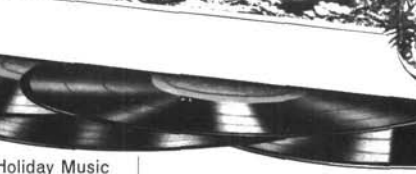

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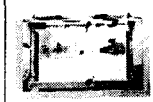

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an editorial by John W. Campbell

Kudos for NASA

The absolute and magnificent success of Mariner IV's months-long, 350,000,000-plus mile mission to Mars represents a complete validation of the U.S. space technologists —JPL division in particular.

A few years back, I had a number of annoyed words to say about the very poor job U.S. space science was doing. That the Russians, with far less massive industrial backing, were able to do such a much better job seemed more than a little peculiar. Particularly irksome was the insistance by U.S. scientists that our space probes were "more sophisticated."

I kept thinking of those very highly sophisticated people, the Café Society set, who are characterized by being very sophisticated, beautiful to look at, and absolutely refusing to work for a living.

A major part of the slow U.S. start was due to our foolish and rather prissy insistance that we were going to separate Military and Scientific space technology—our refusal to use the powerful boosters that were being, and had been, developed by military programs for launching space probes. Thus the Vanguard program, that flubbed so completely, and the very small, much-too-light probes that we started putting into orbit after the Russians had launched their first Sputniks.

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Actually, our first successful satellite launch was put into orbit by using military-purposes hardware that had been on-the-shelf for months. It was not a very "sophisticated" contraption—just a combination of effective, fairly powerful military boosters that *worked.*

It was some time before the U.S. started using the really effective and powerful Atlas and Titan boosters; that policy of separating military and scientific work was a little slow getting out of the way.

It's perfectly obvious that technology—the engineering know-how—doesn't know or care what it's being used for. Like any other objective system of facts, it simply *is,* it has no motives, no purposes, no evaluations. Arsenic is a murderer's poison, or a physician's tonic—arsenic neither knows, understands, nor cares.

The far higher percentage of success the Soviets obtained in those first years of space probing was due to the simple fact that their massive military-developed boosters permitted them to get scientific knowledge much more rapidly than our highly sophisticated, subminiaturized equipment did.

We weren't collecting as much scientific information as we should have for the effort expended—but man! we sure learned a lot about space *engineering.*

The basic difficulty lay in this: No one in the first few years realized what interplanetary vacuum conditions could—and unfortunately repeatedly did—do to the kinds of equipment engineers were accustomed to using. Particularly, we didn't know about ordinary metals evaporating from subminiaturized, ultra-light printed circuit boards, and recondensing in other, and disasterous-to-equipment-function places. We didn't realize that ultra-clean metals in the hard vacuum of space would weld on contact—and so sent up relays that, once they were well vacuumized, welded immovably in position, and ceased to relay. One of our earliest satellites is still up there *beeping* plaintively; it was supposed to be turned off at the end of a year by a time-switch relay. By the end of the year, the relay had vacuum-welded so that it would have taken a cold-chisel to turn it off.

Sure, the answer was simple—encapsulate the relays. Seal the circuits in air-retaining cans. That's no problem . . . except weight.

The Soviets, with their massive, "unsophisticated" approach to the problem were not using printed-circuit subminiaturized equipment. The evaporation of a little metal from their wires wouldn't break a circuit, and in such large and massive equipment, the condensation of a little evaporated metal wouldn't short out vital components. Crude—massive—unsophisticated—but it *worked,* even if it didn't, by its failures, teach you what the subtle problems of space engineering were.

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Gradually those so-sophisticated Café Society type U.S. space probes began to become both sophisticated and efficient. The engineering department learned a very great deal about vacuum techniques they'd never imagined—and that the scientists hadn't imagined—and learned new ways of building ultra-miniature devices that were not only magnificently compact, light, and sophisticated—but also reliable.

Once the basic new rules applicable to space devices were learned, the inherent advantages of the subminiaturized and highly developed U.S. components began to be effective. By the very fact of our early failures, we had been taught—the hard way—relevant factors we would not have learned if those failures hadn't alerted us.

One of the results of this is that, so far, the Soviets have not succeeded in any of their planetary probes. They've tried for Venus and for Mars several times—and theirs have all failed. Both of our planetary probes have succeeded. Mariner I had to be destroyed because of a faulty booster; Mariner II made the trip to Venus successfully and reported back the data it was sent to get; Mariner III had booster trouble; Mariner IV sent back one hundred per cent of the data we'd planned for.

The Soviet probes got into orbit all right—but the probes themselves stopped reporting somewhere between Earth and their target planet.

Mariner IV spent eight months in the ultra-hard vacuum of interplanetary space, with all its exceedingly complex circuitry exposed to low temperatures—roughly −150° C—and with no possible maintenance or repair. Micrometeorites sand-blasted it, Solar Wind whipped at it, the power density of sunlight fell off as it retreated farther and farther from Sol.

Yet when it arrived at Mars, only one of the two possible mid-course maneuver corrections had been needed, the orbit configuration was so precise. It passed Mars within five hundred miles of the precise, theoretical path, and every experimental system on board did precisely what the JPL engineers had planned. It was a 100.000% success.

To get all the experimental equipment Mariner IV carried all the way out to Mars, against Earth's gravity at the beginning, and against the Sun's immense gravity field the rest of the way, required microminiaturization of the equipment. Apparently the Soviet failures have been due to the fact that on such very long missions, the massive-equipment approach they used in their early successes cannot be used—and they're now experiencing the microminiaturization frustrations that NASA experienced in our early efforts. To make microminiature equipment work in space is *not* a scientific problem; it's an engineering-know-how problem, and can be

continued on page 155

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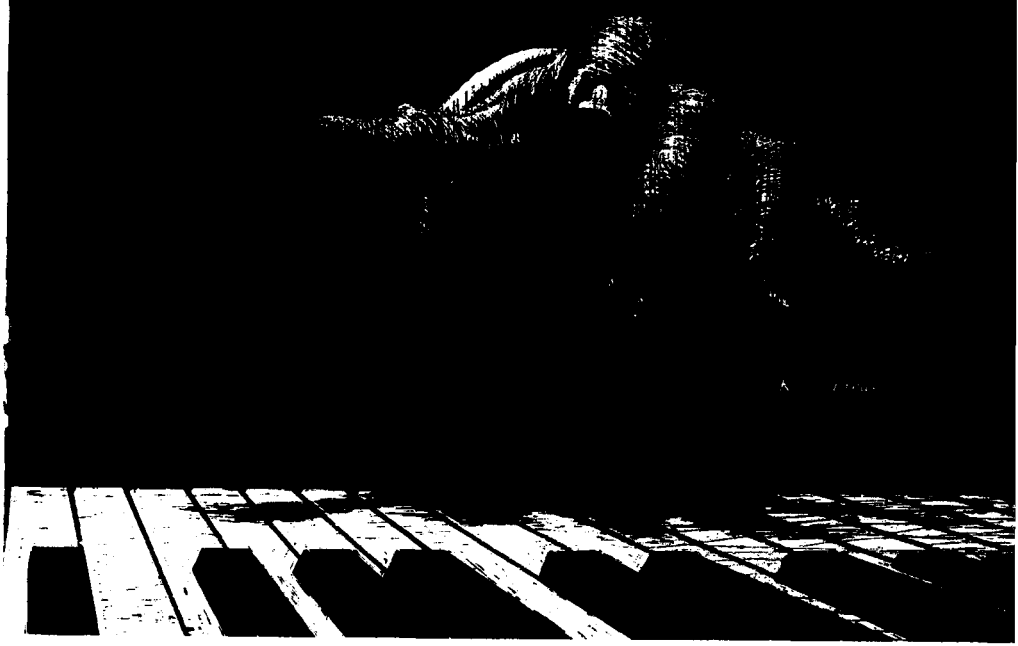
"What's in a name?" Juliet asked . . . but Juliet was a teen-ager, who didn't understand the very hard realities of the world. As the tragedy demonstrated. A name becomes important—and confused!—when a man is really two . . .

R. C. FITZPATRICK



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There were eighteen men on the terrorist raid. Little brown men. Brave. Dedicated. Patriotic. Barbaric by western standards, but civilized by their own. Nor were they cruel; not to themselves, not by the code under which they had been raised. They did only what their fighting men had always done.

The house they attacked had been the home of a Resident Commissioner—an actual house in a village of huts. Well-built and self-sufficient, with a gasoline generator for electricity, it had its own water, heat, and light. It was an obvious target for the raiders. A stronghold of the capitalist enslavers.

The house was occupied by a United States Military Attaché and his family; a Marine Corps Major named John Haldane Fitz-Hugh Adams II. He was thirty-three. His wife, Dorothy, was twenty-five. Their son, John Haldane Fitz-Hugh Adams III, was eight months old and almost ready to walk.

He was a good marine, this American major. He anticipated the raiders and killed four of them in the first attack. But they killed him. And then they killed his wife. But her agonized scream had awakened the baby. He began to cry. He was hidden, but his wailing attracted the terrorists and they hunted him because his cries annoyed them. They did not find him.

Dorothy Saltonstall Adams had been a loving mother, too terrified to use her full intelligence. She hid the baby in the generator room. She hid him in the generator room because it was the smallest, least noticeable room in the house and had no windows. And then, because she was intelligent and knew what might occur, she sealed the room as best she could. She wanted no stray sounds to excite the interest of the raiders. She did a very thorough job.

Two miles off, help was on the way. Australian Constabulary, who, once they had been notified of the sounds of gunfire, acted with a speed and efficiency that was truly heroic. Heedless of losses, by land and air, they clawed their way through jungle growth and guerrilla fire-blocks in a desperate effort to reach the American major and his family in time. They failed.

The major and his wife were already dead, and the baby was turning blue from lack of oxygen, when the Australians attacked. The little brown men tried to escape.

The baby cried on softly for a time, and then he stopped entirely.

When the skirmish was over the Australians withdrew, bearing with them the bodies of the major and his wife. They had not been handicapped by diplomatic objectivity or political necessity, and they left eighteen bodies behind. Little brown bodies. And they searched everywhere for more little brown bodies to leave. This is how they found the baby.

"That's something saved from this blasted mess," said the lieuten-

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ant in command. "At least the child is alive."

The lieutenant was only half correct.

Route 707 is a twelve-lane super expressway running from Boston, Massachusetts, through Charlotte, North Carolina. It serves that section of the North American coast that is really one large city. Some civic planners said it should not run that far south, but the engineers who designed it were allowing for future expansion.

There are nine hundred eighteen cut-offs on this superhighway; one hundred sixty-three between Baltimore and Washington alone. They average three point seven deaths per cut-off per year, and this is not regarded as an excessive price to pay for rapid inter-coastal transportation.

And it is not excessive.

It is not excessive so long as you are not one of the three point seven.

A. J. Mancuszo, his wife Marie, and their young son Johnny were in a hurry. Mr. Mancuszo had been on loan . . . he loaned himself . . . to the Danville Symphony Orchestra. Andrew Jackson Mancuszo was a first-generation American, hence the name, and hence his willingness to share his gifts with his countrymen. But his gifts were also needed in Washington where he was the Assistant Director of the National Symphony. There was a performance scheduled for that night.

Sitting beside him on the front seat, his wife kept telling him he was driving too fast. She was not nagging. She was demanding that her advice be taken with a new-world insistence on equality. And they were equal. Mr. Mancuszo's father had been the conductor of the Philadelphia Orchestra. Mrs. Mancuszo's father had been conductor of the St. Louis Symphony. And they were both conductors in their own right—he of the National Symphony, she of their son Johann asleep on the back seat. She had named him. Johann. He was a second-generation American, and for second-generation Americans names should no longer be that important.

Andrew Jackson Mancuszo, his wife Marie, and their young son Johnny, almost made up the yearly quota of the Alexandria, Virginia cut-off by themselves. Maestro Mancuszo and his wife accounted for over half. Their son did not. He lived. That is, he survived. There is a difference. He made up that point seven.

He was eight months old and his body had not yet learned how to walk.

Now, his body would never learn how to walk.

"I need a drink," said the doctor. "A stiff drink!" His name was Hiram Curtis and he was a Rear Admiral in the U. S. Navy. He was also the Senior Medical Officer at the Na-

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tional Naval Medical Center in Bethesda, Maryland.

"Short shot in a tall glass?" laughed the general. His name was Frederick Tullin. As a major general in the United States Marine Corps he was an old hand at drinking problems.

"Tall shot in a short glass," said the doctor. He signaled the bartender. "Double bourbon and water. How about you, Fred?"

The general put his hand over the mouth of his glass. "I'm getting to be an old man," he said ruefully. "Two highballs before dinner and I eat like a horse. Three . . . and I go to sleep. This is my second."

"I would that I had that problem," said the doctor. He emptied his glass. "Do it again!" he said to the bartender.

The general wrinkled his brow. "You lose a patient, Hy?" he asked sympathetically.

"Lost him before I got him," said the doctor draining his drink. He signaled the bartender again and pointed to his empty glass. "But not that way. I didn't lose him that way." He waited for the bartender to mix his drink and then downed his third double. "I almost wish I had!"

"Basket case?" asked General Tullin.

"Worse," said the doctor, ". . . if anything can be worse." He beckoned for a fourth drink, then changed his mind and waved the bartender away. "You've been following the New Guinea action, haven't you? Did you hear about that American family last week?"

The general nodded. "We heard. The whole Corps heard. A major named Adams and his wife. Fine officer. Had him under my command right after he graduated from the Academy." His face clouded. "But that's not all there is to it, is there? Why did you mention it? I understood their son was rescued and then flown to Bethesda. That's right, isn't it? The son was rescued?"

"He was," said Admiral Curtis. "But not in time. Poor little—"

"Did those heathens mutilate him?" the general roared. "We hadn't heard that! They didn't tell us that! I swear to—"

"Not this time," said the doctor quickly. The general's full-throated roar had swiveled every head in the club. "No, this time you'll have to blame our side—the servants probably. They hid the child in a generator room—a gasoline generator. By the time the Aussies found him he was almost dead from carbon monoxide poisoning."

"But he's alive now, isn't he?" asked the general. "They did save him?"

"Don't you know what carbon monoxide does?" the doctor asked.

"It kills people," said the general frowning. "But, if they got to him in time—?"

"Carbon monoxide combines with the hemoglobin in the blood and prevents it from absorbing oxy-

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gen and passing it on. From a layman's point of view it's a slow and specific strangulation for every part of the body." The admiral waved the bartender over and ordered his fourth double after all. "In the case of the body as a whole, you're either strangled or you're not, there's no middle ground. But with carbon monoxide and the brain, there's a middle ground. God, but there's a middle ground!

"Body cells die and are replenished constantly. That's why you still have skin on your hands. Or I have a throat to pour bourbon down." He poured bourbon down his throat. "The brain's an exception. It doesn't regenerate. When a brain cell dies, that's it. It's dead. Sure, tissue replaces it, but that's not the original, vital brain cell. It's still dead. And half the cells in the Adams boy's brain are dead. Oh, he's alive, if you can call it that, about as much alive as a fungus. And, if he has any luck left at all, he won't live as long as a fungus."

"God!" breathed General Tullin.

"He might help," said Admiral Curtis. "And I'm not being sacrilegious, because He's the only one who might help. And I don't even know if that's the worst part." He snorted. *"Stat magni nominis umbra!"*

The general glanced up questioningly.

"There stands the shadow of a glorious name," said the admiral. "A Roman snob named Lucan said that. I guess I'm an American snob." He shook his head slowly in dismay. "I've known the family all my life. The child's grandfather and I graduated from Brown together. We were fraternity brothers. He was a real aristocrat." He paused and nodded thoughtfully. "We've got an aristocracy in this country, Fred. And it's only partly based on money. Accomplishment is the real key. Sure, we have Rockefellers and DuPonts and Fords, but we also have Roosevelts, and MacArthurs, and Lees. And families most people have never heard of; Bartons, Kinsolvings, Skinners, Van Dorens, Paynes, Harlans, Barbers, Goddards . . . And Adams.

"This branch of the Adams family goes all the way back to John. The boy has bloodlines from almost every great New England family. And it's dead-ended. He's the last. Only he and his grandmother left. Barbara Scaife. That was his grandmother's name, Barbara Scaife. And that's a fine old Pennsylvania family. She was at Pembroke when John and I were at Brown. I was an usher at their wedding." He shook his head sadly. "What a wonderful old woman she is now. And what a terrible cross to bear. Those little pink pilgrims did a better job than they know. They just might have accounted for a future President of these United States."

"And there's no hope?" asked the general.

"Not a prayer," said the admiral.

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General Tullin nodded his head sympathetically and rose to leave. He made no more comment. He squeezed the admiral's arm in a compassionate gesture and left. He was preoccupied and almost trod on several junior officers coming in at the door. The officers moved quickly out of the way and stood to attention, but the general did not acknowledge them. His thoughts were too many miles away. He was not thinking of prayer in relation to the admiral's problem. He was thinking of a place in Pennsylvania called Sunnyvale. And of a doctor named Socrates Jensen.

"Can you find me such a boy?" asked General Tullin.

"I've probably already found him," said Evans. "Eight months old with a useless body? There can't be fewer than three or four hundred on file. Good minds have never been our problem at Sunnyvale, General. It's the bodies that are in short supply." He ran his hand through his thinning hair. "I sound like a ghoul, don't I? And I'd be one if I thought I could get away with it! You don't know the hell I went through for Freddie."

"I know the hell I went through for Freddie," said the general. "And it was worth it. All the lies, and compromises, and subterfuge . . . it was worth it. You should see my son now, Philip. He's seventeen, and every inch a man. He'll be a credit to the Corps."

"You've decided on his future a little early, haven't you?" asked Evans with a smile. "What about the boy? I thought you were afraid he'd be a bookworm."

"He was a bookworm," said the general. "When he thought he was doomed to that wheelchair. But after Sunnyvale gave him back his future, the worm turned into a caterpillar, and the caterpillar into a moth. You should see Freddie, Philip. He never lies down. He collapses at night for about eight hours, and then he gets up running. But they'll take that out of him at the Point. They'll channel all that energy."

"The Point?" said Evans in amazement.

"I know," said the general. "The Tullins are Navy. But we agreed that he'd get a better military education at West Point. He can transfer into the Corps at graduation. No service academy likes to lose its graduates that way, but they allow it."

"You'd better watch out! Those people at West Point are experts in propaganda," said Evans. "Too," he added with a smile.

"I admit it. I brainwashed the boy. But it wasn't necessary," the general said proudly. "Dreams are powerful stuff, Philip. A lot more powerful than us crusty old martinets realize. All those years when we thought Freddie was hopeless . . . when I thought he'd crawled into a book to hide. He was dream-

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ing, Philip. He's told me. He'd sit all day and dream about the battles and campaigns I'd mention: Chapultepec, the Marne, the Chosin Reservoir, Montezuma and Tripoli, Iwo Jima and The Isle of Pines. He'd go there in his thoughts. Second in Command! Right behind his father!"

"I'm a writer," said Evans. "Remember. I know the stuff that dreams are made of . . . my son was hopeless, too. And now he's following in my footsteps. He just got a job with the International News Alliance. He got it," Evans stated proudly, "I didn't get it for him."

"Does he know?" asked General Tullin.

"No," said Evans. "No, he doesn't. I've never told him. For the same reason you've never told your boy, General. They're our sons, but their children won't be our grandsons. You know, and I know, and my wife knows"—Evans stopped speaking long enough to look directly at the general—"I hope your wife doesn't."

"She doesn't," said General Tullin. "Why should she?"

"I agree," said Evans. "Why should she? Information like that isn't 'sharing'. And it's something that would never be guessed, rarely even suspicioned except by a skilled professional—or a parent on the scene. So why should she know? And why should the boys?" Evans shrugged his shoulders. "Their genes are their own affair. And the results will show up in any case. There's not a thing to be done about it now."

"It's always bothered me," the general confessed.

"It's always bothered me," said Evans. "But I'd sooner be disappointed in my grandchildren than see my son a helpless cripple, just to keep a simon-pure strain in the family. And anyway, there's no insurance. The finest families in the world produce morons, and ten successive generations of slobs can turn out one great man."

"Not often," said the general.

"It happens," said Evans.

"But not often," said the general forcefully. "And that brings us back to why I called you down here." He outlined the story of John Haldane Fitz-Hugh Adams III. When he finished, he said, "I don't see too many problems involved. I swing enough weight to have the child released from Bethesda. If you can send someone down to talk to the grandmother, I see no reason why the Adams boy can't be carried into Sunnyvale and an Adams boy toddle out."

"I see several reasons," said Evans thoughtfully. He took time out to light a cigarette. "I'm not sitting here in outraged silence, General," he said finally. "But this is mighty touchy country you want to travel through. You're asking our replacement boy to give up his fam-

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ily name. And I don't care if the family are peasants or plutocrats, the boy has a right to his name. I'm not thinking about his children's name. I mean his name, and the name of his father."

"What's in a name?" asked the general. He smiled in wry amusement. "Now I'm a poet! But it's a good question, what's in a name?"

"Your son's name is Tullin," said Evans. "Would you change it? Would he?"

"My son was fourteen," said General Tullin. "And your son was almost twenty. And so far as I know, every child that Sunnyvale has produced was already past the age of self-awareness. That doesn't apply here."

"It applies," said Evans disgustedly. "And if you don't believe me, walk into any juvenile court in the land. They rip adopted children from the arms of their true parents —and by true I mean the people who have loved and cared for them from infancy—they tear them away without regard for the feelings of the child or of the adopting family. And unless the natural parents are paupers or committable psychotics, they don't even worry about material benefits or the child's emotional welfare. And all because one claiming parent or the other is 'Natural'. The woman may be a reformed harlot who hasn't seen the child since birth, but that doesn't matter. The man may be an immature jerk who's finally managed to grow-up a little, a very little, but that doesn't matter either. Just so long as the name is the same."

"That's not fair," said the general. He made it a statement of fact.

"No. It's not fair," said Evans. "But it's 'justice.' And it's an attitude that has plagued the human race since pre-recorded time. On one hand you have the liberal minions screaming that heredity doesn't count. And on the other hand, you have these very same minions insisting on hereditary rights."

"It doesn't follow," said the general.

"It doesn't have to follow," said Evans. "The other side of the coin is just as bad. The hereditary aristocrats who say nothing counts but birth . . . and then beef-up their ranks with phony titles and illegitimate children. That may not have caused the Dark Ages, but it sure as hell kept a blanket over the light. Don't try to be logical about this, General," Evans warned. "You may think you are, but you're not. And I'm not. And people aren't. You can stand on either side of the fence—and you're wrong. And you can't sit in the middle—that's wrong, too! When you come right down to it, the only fair way for us would be to tell the world about Sunnyvale, and then judge the children on their own merit. But who would that be fair to? The children? In our society they'd be torn apart." He lit another cigarette and then chewed thoughtfully on the match.

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"In any society they'd be torn apart."

"The hell with all this," said the general. "Let's do what we've always done."

"That's the one thing you don't want to do," said Evans. "You want the Adams boy to carry on, John Haldane Fitz-Hugh Adams III. Not the other fellow. And that isn't the way we've played the game. There's a plaque in the entrance hall of Sunnyvale. I put it there a year ago. When we had that hassle about the Magee child. Remember? It begins: *'To men a man is but a mind . . .'* What you're asking us to do is subordinate the mind to the body. And I don't know if it will wash, General. I don't know if Dr. Jensen or Dr. Schorin will go that far."

"I am not asking you to subordinate the mind to the body," said the general. "In this particular instance there is no mind. Not yet, at any rate." He turned his head slowly from side to side in a very deliberate negative. "There is not yet any self-awareness here—not in the boy we'll use. He won't be a conscious entity. No one will have told him who he is, or to implant that necessary feeling of individuality. He'll still be too young. If the boy were an orphan and you told him his name was Rumpelstiltskin, he'd believe it. But, if you told him he was a fairy prince, he'd believe that instead. And that's my point!

"If he believed he was a Rumpelstiltskin, and had the type of upbringing that a Rumpelstiltskin receives, he would, with the head we give him—and assume there's a fine brain in that head—probably grow up to be a brilliant, but immoral, amoral, odd old man. But with the same brain, growing up as a fairy prince, receiving the training of a fairy prince, and the advantages of a fairy prince—believing himself a fairy prince—why it's odds-on he'd grow up to be a prince among princes. Or an Adams among Adamses. And all because of the name—and the advantages that accrue with the name. Now I'll grant you that a few Rumpelstiltskins might turn out all right, and a few—"

"I think you might have the answer," Evans interrupted thoughtfully.

"You agree with me?" said the general in surprise.

"I neither agree nor disagree," said Evans. "I've thought about the problem before, but only theoretically, and I've never seen an equitable answer." He shrugged. "But then I've never needed one, we've never been faced with this problem before. It's always been the healthy mind that concerned us most. And always with a loving and worthwhile family waiting in the wings. And, even if the family were not loving and worthwhile—Evans shrugged again—who are we to judge? But there has always been a family!" Evans tossed the general an offhand

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salute. "I think you've come up with the answer. Let me comb through my files. There must be a few orphans there. With luck, one may fill the bill for the Adams boy."

"What if you don't have one listed?" asked General Tullin. "Can't you find one?"

"New approaches bring new problems, General," said Evans. "We have a time factor here. The child we use can't have reached the age of self-awareness, and he can't have a family. He . . . They . . . can't know who he is, or who he should be."

"Don't limit me that much," said the general. "I used an orphan for a point of discussion, I don't care who the child is. And time can't be that critical."

"The hell it can't," said Evans. "You start playing games with minds and names—with children who know and parents who care—and we'll need more psychiatrists than surgeons at Sunnyvale." He paused meaningfully. "And we'll have more detectives than doctors!" Evans was adamant. "I see your point, General, but I'm afraid you're missing mine. I'm not so much concerned here with this particular boy and this particular family, although, Lord knows they're important enough. I'm trying to look at this from an hereditary . . . and . . . an environmental angle." He stressed the "and." "Certainly I'm sympathetic to the boy and his grandmother, but that's not our 'hook'; that can't be our starting point. For once it's the generalities, *not the specifics, that are most important.* Not the boy, not this boy. But the children of this boy." Evans stopped and nodded his head in agreement with himself. "The children of this boy's body," he amended. "And the children's children, and their children . . . and the cousins . . . and the nephews . . . and the aunts."

Evans stood up and made ready to leave. "I'll find a boy for you, General, now I'm on your side. In this case, in any case like this, it's going to be that important. That's why I agreed with you so readily; I've considered this before. Heredity is as vital as environment—and heredity doesn't hinge on name. But environment is every bit as important as heredity—and environment *does* hinge on name. A name can't turn a clod into a genius, or a genius into a clod, but it can sure afford an edge. And that edge can be the difference between the great and the near-great." Evans put on his hat and started out the door. "In this world, greatness is always in short supply. We'd better not . . . waste . . . a . . . drop!"

Philip H. Evans was a very dedicated man. But, before he became a dedicated man, he was a crackerjack reporter. This does not mean that he was brash, boastful, and belligerent. Nor that he went rushing about the countryside sticking

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his nose in where it did not belong. He did not fit any stereotype—no good businessman ever does. And any good reporter is a good businessman.

Philip Evans had been a good businessman. With a thoroughly compartmentalized mind. He kept his ears open—always. His mouth shut—sometimes. His nose pointed in the right direction—anytime. And he worked sixteen hours a day. Every thought, fact, opinion, experience, and hunch he had was somehow sorted out and filed away in his wonderful brain—and in his wonderful records—so that it was always available to him.

Once, years before, he had written a story, a fantastic story about a fantastic doctor in the United States Navy who had saved a man's life. The man, a sailor on a submersible carrier, had been almost cut in half when a landing cable parted under the impact of a returning missile. The doctor, a full lieutenant named Stephen Socrates Jensen, put him back together; not only saved his life but put him back together, so that the man eventually returned to duty. It was such a fabulous story that it made the third page of the front section of almost every newspaper in the country.

Twelve years later the doctor resigned from the Navy. This was not a fabulous story, and if Evans had not been in Washington at the time he would probably have never heard of it. But he did hear of it, and since it is somewhat unusual for a middle-aged career officer to resign from the Navy, Evans investigated. This time the doctor had not saved a life. This time there was a man who was already dead of a crushed skull. And a man who was not already dead of a crushed body. Not dead perhaps, but dying. The doctor, a Captain Stephen Socrates Jensen, decapitated the dead man, which was unbelievable. And he decapitated the dying man, which was unthinkable. And the operation failed, which was unforgivable. The Navy did not try him for murder, but they did make him to understand that he was no longer an officer and a gentleman, and that his resignation would be forthcoming immediately. Captain Stephen Socrates Jensen resigned, and the Navy took all the standard, effective steps to hush-up the whole ghastly affair.

Evans, who was only the twenty-fifth reporter to stumble onto the story, agreed with the Navy that it should be filed and forgotten. And this he did. He filed it away in his wonderful brain. And he forgot it as best he could.

Two years after that his son was maimed on a football field. A shocking accident that rarely happens, since football prepares young men for the game of life. But the only game it prepared the younger Evans for was ceiling watching. He was paralyzed from the neck down. He had crushed not one but three of his cervical vertebrae and the

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doctors labeled him a quadriplegic and said, "There is no hope for him." But the Evans clan made lousy quadriplegics, and even lousier ceiling watchers. The elder Evans decided that he would find some hope for him.

And he did.

He found Stephen Socrates Jensen. And it was not a hard thing to do. In defense of the Navy, it must be said that they are forever forced to look over their shoulders after one crusading congressman or another. Civilians do not have that problem. They could, and did, find Dr. Jensen and his sometimes miraculous, but not always meticulous, methods thoroughly acceptable. The good doctor had had his choice of choice positions. He settled down in Philadelphia, his medical hometown. And there he performed no more weird and wonderful operations. But he did perform a goodly number of skillful and necessary operations.

Philip Evans did not want a skillful or necessary operation. He wanted one that was weird and wonderful. And where else should he go but to a doctor who had repaired a severed spinal cord, and who had not been afraid to gamble on grafting one man's head onto another man's body. That the operation had failed did not fill Evans with foreboding. He worried, and would worry, but, if it were a reasonable risk— Most operations failed sometime. Evans felt that nothing in this vale of tears was a lead-pipe cinch; all men had to gamble once in a while. He did not know exactly what else he wanted, but he did want hope. And Dr. Stephen Socrates Jensen offered hope.

And Dr. Jensen did seem to hold out hope for a while. He was, barring all else, a marvelous surgeon. He thumped Evans' son, and he probed Evans' son. And he X-rayed, and he Y-rayed, and he P-rayed. But in the end he gave no more hope than any other doctor. Except.

The other doctors said, "If only—"

Jensen said, "If only another body—"

It was only his wife's restraining hand that prevented Evans from rushing out and decapitating the first chance passer-by—that, and further conversation with Dr. Jensen. It seemed that not any body would do, it would have to be the right body; the right age, and the right size, and the right blood group. And it should be the right sex, and the right race, and the right this and the right that—and the odds on such a body, freshly dead, being available at the right time were so infinitesimal as to be forgotten about. That was why his naval career had come to such an abrupt halt. Not because such an operation was beyond him, but because he had been forced to try it

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when all the necessary conditions were not present. He was not apologizing, you understand, he was explaining. He had tried to save a life. It was his moral duty to try and save a life. And only the Almighty never failed.

He thanked Evans for his interest, clucked sympathetically, and left.

The next two weeks were hell. Hell for Evans. Hell for his wife. And an extra hell for their child. When all was hopeless . . . to have hope at all . . . and then to lose it again. It was the deepest hell of all.

In the end it was his wife's wishful thinking, and not Evans' wonderful brain, that supplied a way out. They were walking down the street when Mrs. Evans spied a perambulating plant; not a rose bush, nor a pine tree, but a man. A healthy, vital, vibrant, mindless man. He was not an unfamiliar figure, they'd seen him before. Or they'd seen someone like him before. Every neighborhood has one, every upper-middle class neighborhood. Where the parents are too well-off for the state to assume the burden, and not well-enough-off to have him institutionalized when he doesn't actually require it. He was happy and content, and he performed, to him, very important functions; he helped the paper boys deliver newspapers, he fetched empty boxes from the grocery store, and he mowed all the lawns that needed to be mowed. The fact that his lawnmower cut no grass did not disturb him, and it most assuredly did not disturb the neighbors. That way their mint beds, flower gardens, and flagstone patios stayed reasonably intact.

"Wouldn't it be wonderful," said Mrs. Evans sadly, "if our Tim could have his body." Her doleful eyes followed the village vegetable. "And it wouldn't be unfair—to either one of them. His body may not be perfect, but at least it moves. And in Tim's body his mind could be content. We could put a television on the ceiling and he'd be happy as a lark."

It was a hateful, horrible, hopeful thought. And the tendrils of Evans' mind wrapped around it like the tentacles of a starving cuttlefish. He knew nothing at all about imbeciles, but he had the inclination and the ability to find out. He knew that this particular idiot was probably not acceptable, but there must be others. There had to be others!

There were others. Many others. And their penetrations and percentages—permutations and probabilities—astounded Evans. They violated almost all of his most cherished beliefs. Environment and the pressures of modern life had no bearing on the situation at all. Heredity had not much more. Whether individuals created conditions, or conditions created individuals was

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a moot point, and not yet settled to anyone's satisfaction. But where man as a group was considered there was no doubt. Percentages were absolute. There were more mentally deficient and more mentally ill in the same and exact balance as there were more mentalities. The only proportional rise came through a decrease in other afflictions. Percentages were the same for as far as statistics were kept, and for as far back as they could be intelligently surmised.

Evans found, for instance, that if you counted all the morons in a population, then you had counted, accurately, the entire population. He found out, or rather, he did not find out, the number of mental defectives in the Army; all armies were identical in that respect, and if you knew the exact size of their mental wards, you would know the exact size of their armies and divisions down to battalion strength. It was a military secret of the highest order. Evans could not even discover the appropriations allocated to psychiatric care; the figures were never broken down.

Mental deterioration and mental deficiency were not allied of course. And Evans, who had broken more than a few shibboleths in his time, still retained a few shibboleths of his own. He was not a religious man, in the sense that he did not hold to any organized religion. But he did regard the human animal as a creation of the Divine, and such concepts as sanctioned euthanasia, licensed sexual aberration, and government sponsored sterilization appalled him.

For these reasons, Evans knew that he could not use an intelligence quotient or a psychoanalytical norm as his yardstick. Even with his own son in mind, he could not play God. He could not weigh the intelligence of one man against the lack of it in another. Nor the sickness of one man against the health of another. So long as there was any intelligence, any awareness at all, then there was a man; and he must remain forever inviolate. And in the case of the mentally deranged, from whatever cause, for whatever reason, so long as life remained there was hope, and so long as there was hope, they also were untouchable.

Evans found himself in the depressing position of having eliminated ninety-nine per cent of his field of inquiry before he began his inquisition. It was a discouraging circumstance. He had no prospect of achieving results, and no taste for any results he might achieve. But, if there were any eligibles in that last remaining one per cent . . .

There were. They were few and fissile and far between, but there were a few. Three and one half percent of all retardates were totally dependent. They were totally uncognizant of the life around them —and of the life within. Investiga-

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tors could elicit no meaningful response. They assigned these retardates an I.Q. of from 0 to 19, depending solely upon the degree of response they could not elicit. But this was a concrete statistic, a measurable figure, and Evans followed it fiercely. He followed it well past his own normal conceit and found stupidity not so rampant in the world as he had imagined. Imbeciles, idiots, cretins, mongoloids, microcephalians, morons, "stupes"—including even those educatable morons and those with I.Q.'s under eighty—they still totaled less than three per cent of the population. And of this three percent, only three and one half percent were "his," but still, that gave him roughly nine for each ten thousand. And in a nation of two hundred sixty million—and beyond them a world of billions . . .

Surely some would have bodies that did not match their minds. Surely some would be healthy organisms. Surely some would have psyches not duplicated by their physiques.

Evans began his search.

He did not recognize it as his life's work. Not then. He began as the hunter primeval, and the "meat" he hunted was only for his own family. Originally. But then, later, he hunted for the sons of others; because of his needs, he knew their needs; because of his suffering, he recognized their suffering; his hopes, their hopes; his dreams, their dreams. It eventually became not a search, but a quest, and then not a quest, but a crusade.

He did not debate, then, or ever, with himself or with others, about the rightness or the wrongness of his decision. He simply acted, and then debated whether there was a crying need for him to have taken action . . . or a terrible waste if he had not.

"All the bushes are outside, Philip," said the gray-haired nurse. Her name was Helen Harper Hinman, and the handling of generations of student nurses had given her a certain laconic humor.

"What bushes?" said Dr. Jensen. As usual, the lean and whiplike doctor with the lean and whiplike mind was not paying close attention. He was neither naïve nor absent-minded. He simply had a basic fundamental belief that all things not concerned with medicine were not concerned with anything important.

"She means the ones I'm beating around," Evans said wryly.

"I fail to see a reason for bush beating," said Dr. Jensen impatiently. "You've told us you've found an available body. Fine. Bring it here. So long as it's legally available, I see no problem involved. But you've fractured enough of my ethics as it is, Philip," said the doctor grown suddenly serious. "I won't stand for body-snatching. But, if that isn't a con-

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sideration here," he shrugged, "then I see no problem."

"The body's name is Adams," said Evans shortly. He was offended by the doctor's reference to body-snatching.

"That is completely immaterial," snapped Dr. Jensen. "I've told you before—"

"That," said Evans interrupting, "is quite material. If I bring the Adams body here, an Adams boy walks out in it."

"Impossible!" said Dr. Jensen.

"Then you're right," said Evans, "there is no problem." He paused for effect. "And there'll be no body either."

"Then there'll be no body," said Dr. Jensen flatly.

"Philip! Stephen!" Mrs. Hinman managed to put a motherly disgust in her voice. "Honestly! You two have begun to talk to each other as though you were father and son. And with about the same degree of understanding."

Dr. Jensen's naval background came to the fore. "That's enough, Helen," he said curtly.

"That's not enough," said the non-naval nurse. "And you keep quiet, too," she said to Evans, who had had no immediate plans for opening his mouth. "The three of us have been together long enough so that we each know the goals and aspirations of Sunnyvale. Your ethics are no finer than ours, Stephen Socrates Jensen! If Philip feels the necessity for bringing such an issue up, then he must have good and sufficient reason. You at least owe him the courtesy of hearing it. And you," she said turning to Evans again, "owe us the courtesy of not being coy. If you have something to say—say it! Neither I nor Stephen are inclined to drag it out of you."

"Mea culpa," said Evans, but without being flip. "I apologize. Defense mechanism I guess. It's a pretty touchy subject and I was anticipating a rejection before I opened the matter." He nodded his head affirmatively. "You're both more open-minded than that. I apologize."

They were sitting in the doctor's office at Sunnyvale. Evans stood up and crossed to the window looking out over the playground. Below, in the yard, a dozen once hopelessly handicapped children romped with a joyous abandon that could only be experienced by a child who had never expected to play again. Evans gestured. "I'm proud of that," he said. "As proud as though I'd performed the operations myself."

"No one is minimizing your contribution," said Dr. Jensen impatiently. He suddenly recanted and smiled softly. "I'm only a mechanic, Philip. It took your vision and imagination to bring this all about."

"I know that," said Evans. He held up his hand in a deprecating gesture. "The contribution—not the 'bringing about'. We've all done

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our share. It's just that I have a selling job to do and I don't know how to start. I've been sold myself," he added.

"All right," said Mrs. Hinman patiently, "I'll start you. You have the body of a boy named Adams. You want to bring him here, have a healthy mind implanted, and yet still have him remain a boy named Adams. You want the boy named after his body and not after his head. All right," she said again. "Why?"

"Because he's a boy named Adams," said Evans deliberately. "There's no better way to put it. We've had a taboo here at Sunnyvale. Not a taboo really, but those of us most concerned with it have been the least inclined to discuss it." He waited for a response and when none was forthcoming he went on. "I'm talking about genes. And the unpleasant fact that the body governs the genes. My son Tim is alive and healthy thanks to Stephen here. And without Stephen I would probably have no son, and certainly no grandsons. But because of Stephen, any grandsons that I have won't really be mine. They'll bear my name and that of my son, but they won't really be mine—or his. In actuality they'll belong to the family of the child whose body Tim wears. Now do you see why I hesitated? And at what I'm driving?"

"Certainly," said Dr. Jensen. "But we settled this issue long ago. That plaque you put in the entrance hall? You didn't put it there for show, did you? And I hope you didn't go searching through odd quotes merely for something that would fit. That quotation puts into words, as neatly as I can imagine, exactly to what Sunnyvale is dedicated. And exactly why I helped to found it." The doctor stopped speaking and furrowed his brow in concentration. "I can't do it," he said finally, "I can't think of a thing. You know, I have memorized entire passages of medical text, but I don't think I know any poetry. Never had time. Not even a complete nursery rhyme." After making this statement the doctor closed his eyes and leaned back in his chair. He began to recite:

"To men a man is but a mind.
Who cares
What face he carries or what form he wears?"

He opened his eyes, canted his head, and looked directly at Evans.

"But woman's body is the woman. O,
Stay thou, my sweetheart, and do never go,
But heed the warning words the sage hath said:
A woman absent is a woman dead.

"As you know, the whole poem is a rather zany definition of absence—which also seems appropriate—by

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a fellow named"—Dr. Jensen winked—"Jogo Tyree. It seemed such a complete and fundamental statement of Sunnyvale's mission that I took the trouble to memorize the entire passage. What's happened, Philip? Have your sentiments changed?"

"No," said Evans. "Yes." He laughed sardonically. "I must sound like a schoolgirl. But let me try and put this into words. And forgive me if I sound like an aristocratic snob. And I will," he warned.

Evans stood with his back to the window. "This world of ours has never had enough great men. There have never been enough great captains of industry to make a minimum standard of living available to all; never enough military geniuses to make wars more decisive and less bloody; inspired composers to make life more worthwhile; or dedicated inventors to make life more pleasant." He nodded his head slowly in cadence with his words. "There are simply . . . not . . . enough . . . great men. And most of these men have come," he shrugged his shoulders, "from who knows where? From obscure families. And after they pass, the families go back to obscurity. They may last for a generation or two, but usually the family genes have only enough 'steam' to produce that one unusual man; Lincoln, Manville, Dodge . . . in relation to the fathers, the sons were nonentities.

"Then again, the really great men —the Washingtons, or Gershwins, or Steinmetz's—die childless. But there are a few families—a very few considering the population of the world—that do not pass back into obscurity after their illustrious ancestor has left the scene. They go on and on, these unusual families, generation after generation, and if anything, the sons or grandsons exceed the fathers. Ford, Taft, Crane —and across the sea, Churchill, Huxley, Rothschild—there's no point in cataloguing names, you know the type of family I mean. You can name a dozen yourself. Adams is such a family. And not only in politics. But in business, in literature, if nothing else, in community leadership, there has rarely been a generation in our country's history that has not seen at least one great Adams."

"But the boy won't be an Adams when he leaves here," Dr. Jensen said matter-of-factly.

"Yes he will be," said Evans. "That's where you're wrong. That's where we've all been wrong. When he leaves here, he'll still be an Adams. At least, half of him will be . . . and in the long run, it's the most important half. Assuming he's now able to lead a normal life, and that's a good assumption, he should lead a full and useful existence including marriage and children. And those children are Adamses!"

"Only half," said Mrs. Hinman.

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"The other half comes from the wife's lineage."

"That's a good point," said Evans. He squinted at Mrs. Hinman through the haze of his cigarette smoke. "But it holds true in any case. And it's a man's world, Helen." He turned again to the window. "Those children are Adamses. And their children will be Adamses. And their children. And so on, ad infinitum—or ad Armageddon. And don't you realize that if we avoid an Armaggedon it will be because of the Adamses and the others like them in this world."

"Everything you say is true, Philip." Mrs. Hinman got up and walked over to Evans at the window. She looked down on the children below. "Let's assume your Adams boy is down there. Everything you say is true. And it will remain true, regardless of the name he carries. Jones, Smith, Goldfarb . . . that's the name of the boy down there—not Adams. And don't worry about the name of his children or grandchildren. That only matters to existing relatives, not to posterity. The boy-father is Smith or Jones or Goldfarb. And the children, and grandchildren will be great or near-great regardless of their names."

"Genes don't have personality, Philip," Dr. Jensen added.

Evans turned from the window. "You," he said including them both, "are very brilliant people. You," he said to Dr. Jensen, "are the finest surgeon in the world. And you," he said to Mrs. Hinman, "are a latter-day Florence Nightingale. You're everything a nurse should be." He walked to an ashtray and stubbed out his cigarette. "And you're both among the world's worst politicians. I have only to take you back to the Magee case to prove it. If Dr. Schorin hadn't been the kind of a man he is, there'd be no more Sunnyvale. Since then, you've let me have the lead in this, so that now we're pretty well underground, although it will still be a year or so before we'll be completely safe. We'll have to change locations before we'll be adequately hidden. You wouldn't believe me before until after we'd had a near disaster. But believe me now, before we have another disaster—and it would be a disaster for this country to lose the Adams family."

"This is only one branch of it," said Dr. Jensen.

"It doesn't matter whether it's a branch or the trunk," said Evans. "I'll say it again! This country . . . does . . . not . . . have . . . enough great men. Or great families. And the families have a great deal to do with the men. And here I mean the family name. It influences the lives they lead, the women they marry, the people they meet, and how those people respond. You are much mistaken when you say that names don't matter. They do! Can you imagine a President of the

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United States named Goldfarb?"

"Yes," said Dr. Jensen deliberately, "I can. I—"

"Then how about Hyman Lipschitz," Evans continued sarcastically. "Or Pasquale Marinaccio. Or Nicholas Pryzbyzwyzewski . . . he pronounced it Shiv-ih-shevsky. He was one of my instructors in college."

"Don't get cute, Philip," said Mrs. Hinman.

"I'm not being cute," said Evans. "I'm being realistic."

"No you're not," said Dr. Jensen in annoyance. "You're jousting with windmills. We've already had a Jewish President in this country."

"Yes, we have had," said Evans. "But his name was Fine, not Finkelstein. And you'd better be able to understand the difference."

"I do understand the difference," said Dr. Jensen. "And there is no difference. And if the human race can't see that then the human race had better change!"

"It changes," said Evans. "But slooooooooowly! And we can't wait for the change to happen, we have to make it happen. And 'we' can do very little about it. It's the Adamses of this world that make the changes. And sometimes only because they're Adamses." He turned to face Mrs. Hinman. "You can forget about existing relatives, the boy only has a grandmother and General Tullin is working on her now. Regardless of our decision, we'll have to keep it from her. These are fine people, Helen. I was exaggerating when I said there'd be no body. If only half of what the general has heard about the woman is true, we'll get the boy in any case. That's why we'll have to keep it from her. She'd be reluctant to take another boy's mind. And she'd be shattered by giving up her grandson's body. But it's posterity that I want to do this for. This country needs the Adamses. It needs the Adams genius. It needs the Adams genes. And it needs the Adams name!"

"I'm not going to block you in this," said Admiral Curtis, "I just can't see your reason in taking the boy. No one else is going to be able to do anything more for him than we can. Or any less for that matter. I'm not Gung Ho service, Fred, but Bethesda is as well equipped as any hospital in the world. Mrs. Adams has gone through enough hell as it is, why raise false hopes?"

"You knew my son suffered from muscular dystrophy, didn't you?" asked General Tullin.

"I know your son was afflicted with what was diagnosed as muscular dystrophy," said Admiral Curtis, anticipating the general's argument. "I was called in consultation."

"Do you know he's entering West Point in the fall?" the general asked.

"I know that, too," said Admiral

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Curtis in resignation. He thought he knew what was going to follow. "I also know that miracles happen. And don't propagandize with me!" The admiral pointed a finger in aggravation. "I know your son is healthy. I know he was diagnosed as hopeless. And I also know that there are powers in this world not yet understood by medicine. We don't deny faith healing, Fred—we even try to use it ourselves. But you are not an expert in medicine because your son was healed through unknown causes. And implanting false hopes in Barbara Adams is a cruel thing to do—a wicked thing to do! The woman is frantic. She may seem resigned and able to face this intelligently, and normally she would be, but the boy is the only thing she has left in this world. And he is no longer really alive. Until she can accept that, she'll try anything. Even quackery. Even when she knows it's quackery."

"Ever hear of Sunnyvale?" asked General Tullin.

"No," said Admiral Curtis.

"That's where I took my son," said General Tullin. "And I wasn't a frantic old woman. Nor did I go in for quackery."

"And Sunnyvale did the job?" asked the admiral skeptically.

"That it did," said the general.

"Did you ever consider that our diagnosis might have been wrong?" asked the admiral.

"Certainly," said the general. "And I've thought about miracles and faith healing, too. But Sunnyvale isn't run by mystics or saints, it's run by doctors and nurses. Reputable doctors and nurses."

"There are all sorts of reputable doctors and nurses," Admiral Curtis said dryly. " 'Reputable' means they don't wiggle their wangs in public."

"Let's give me a little more credit than that," the general said forcefully. He pointed to the stars on his shoulders. "I didn't get these by being taken in by kooks—even sincere and dedicated kooks."

"You wouldn't be able to recognize a medical kook," said Admiral Curtis, "any more than I could spot a military one. You're a hoplite, not a healer. That's how these quacks get a reputation, they take credit for mistaken diagnosis or natural regressions. And the people they deal with don't know the difference."

"Who doesn't know the difference?" said the general in irritation. "I didn't investigate these people, Hy, I had them investigated. And you don't fool Naval Intelligence. I had a comprehensive and impartial report." He did not, of course, but he hardly thought the admiral would check his statement. "They weren't interested in the how or why of cures, only if the cures were legitimate. And if the people involved were legitimate. Tell me, have you heard of a doctor named Schorin? Mordecai Schorin?"

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"Why yes I have," said the admiral somewhat taken aback. "He was on loan to the Air Force when they had that outbreak of Type VI polio three years ago."

"How about a nurse named Hinman?" asked the general. "Helen Harper Hinman?"

"A children's specialist?" asked the admiral. General Tullin nodded. "I know of her, too," said Admiral Curtis in surprise.

"They're both at Sunnyvale," said General Tullin. He did not mention ex-Captain Stephen Socrates Jensen. "Now I'm not guaranteeing that these people can do any good for the Adams boy—and I've made that clear to Mrs. Adams. But at least it's worth a try. You've admitted that you've given up, that there's nothing else that you can do. At least let these people at Sunnyvale have a go at it."

"I've already said I wouldn't block you," said the admiral. "But make sure that Barbara knows it's only a gamble."

"She's right downstairs in the library," said the general. "I left her there because I wasn't too sure what your reaction to all this would be. You're a crusty old buzzard sometimes, Hy. Have one of your corpsmen bring her up here, and we'll both convince her of what a long shot we're taking. But at least it is that," he added, "it's one last shot at the target. She's your friend, Hy, don't try to deny her this one last chance."

"I'm not going to deny her this chance, Fred. I'm a realist, I couldn't if I wanted to. I'm not even going to try and talk her out of it. But I do insist that she understands fully how hopeless it really is." He leaned forward in his chair and pressed a button of the intercom on his desk. "Crusty?" said the admiral with a chuckle. "That, my friend, is known as the pot calling the kettle gray. Miss Stennis," he said when his secretary answered, "go downstairs to the out-patient library and bring up the visitor waiting there. She'll be a well-dressed, middle-aged woman named Adams. Mrs. Barbara Adams."

"Yes, sir," said Miss Stennis. "Right away."

"Middle-aged?" said the general.

"I," said the sixty-two year old admiral determinedly, "am middle-aged. And Barbara is younger than I am."

"Prettier, too," said the general.

"Sexier, too," said the admiral, "if she can interest a hard-nosed, old buzzard like you in giving her a helping hand. How'd you get in on this anyway, Fred? I didn't know you knew the Adamses."

"You mentioned them," said General Tullin.

"Bar talk," said the admiral. "That wouldn't get you started."

"It did," said the general. "At least it lit the light." When the admiral indicated interest he continued: "I'm a bigot. Some people are

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better than other people," he said flatly. "And that started me thinking about all the better people I've known. Understand first that I'm not knocking the other services, but the Marine Corps is different. Family connections and social position mean almost nothing. Seventy per cent of our officers come up through the ranks, or from non-service colleges. We don't have the same father-son-grandson chains that bedevil the Army and Navy. Those chains are forged in Newport, Sea Island, and Palm Beach. Our chains are forged in action. Ability is the only thing that counts in the Corps. But we still do get service families; second, third, and fourth generation marines. Damned fine marines!

"You ask me how I know the Adamses? After that conversation we had in the club it suddenly dawned on me that I knew the boy's granduncle, his grandfather's brother." The general leaned back in his chair. " 'Your' brother went to Brown and joined your fraternity. 'My' brother ran away from prep school and enlisted in the Marine Corps when he was seventeen. He was a noncom in one of my companies in the battle for North Borneo—when Malaysia fell apart and the Philippines needed help. You know, when the State Department forced our withdrawal because of world opinion. After that happened, we enlisted in the Philippine Army. I was eventually promoted to general, and Adams was made a full colonel at the age of twenty-three. And not because he was an American! In some respects the Filipino is a better soldier than the G. I. And their best officers are on a par with our best. No. Adams made colonel because he was that good. And I was an experienced field commander. The Filipinos recognized it."

"Interesting," said the admiral. "So what? I'd like to hear more about your career sometime. But what's that got to do with this?"

"Adams!" said the general as though the word were self-explanatory. "I did some checking. Before the Adams I knew, and this Adams, the boy's father that we both knew, there was a Major Adams, same Adams, decorated in the Vietnamese War . . . after a helicopter assault that he led personally recaptured the Plain of Jars. And there was a Captain Adams at Tarawa, who was awarded the Congressional Medal. And a Lieutenant Adams on *Columbia,* Dewey's flagship at Manila Bay. And a Brigadier Adams of Massachusetts Volunteers—who didn't get his pants shot off at Bull Run. It goes on and on. That's why I want to help the boy. His father's dead, and the boy himself may seem beyond help, but maybe he can be improved enough to at least father children. I'm not an old man, Hy. I may be alive in another twenty-five or thirty years. I'd like to be

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able to count on the men who will be fighting for me."

"Spoken like a true pacifist," said the admiral.

"You'd better believe it!" said the general forcefully. "I'm a pacifistic fighting man. I'm a professional. I know what fighting's all about. And that makes me a bigger coward and a truer peace-lover than any wide-eyed idealist in the world. But that doesn't mitigate the fact that there are times when it's better to fight than to run." He paused and thought about what he'd said. "I don't have any say in when we fight—and I shouldn't have any say in when we fight. But I sure want a say in how we fight, and whom we fight with.

"I'll take all the O'Tooles and Kropotkins and Solomon Grundys you give me, but I want a few Adamses in there, too. There has never been a twenty-year span in our history when we weren't fighting somebody." The general snorted. "There's never been a twenty-year span in anybody's history when they weren't fighting somebody. And don't give me any philosophic sheep dip about who's a good guy and who's a bad guy. The other guys are bad guys. And if the good guys didn't stand up to them —regardless of the reasons—it would be a lot filthier world we would live in than we live in now."

The admiral shrugged. "Who can tell?" he said.

"The Jews," said the general. "The Poles, the Negroes, the Tibetans, the American Indians. And a hundred assorted nations that have disappeared from the pages of history because they couldn't, or wouldn't, stand up for themselves."

"Suppose our theoretical grandchild turns out to be a minister?" asked the admiral. He took a deep breath. "Or a gir-rull?"

"How'd you like a belt up alongside the left ear, Mister?" said the pacifist general. "You know what I mean. Major, minister, or factory manager, what does it matter? If he's an Adams, he'll be good. And if he's good, we need him."

The admiral was saved from a belt up alongside the left ear by a knock at the door. "Come in," he said.

The admiral's secretary ushered in Mrs. Barbara Adams, then closed the door softly behind her as she went out. Mrs. Adams crossed the room gracefully, picked out the most advantageously placed chair, and seated herself before being asked. She was a lovely woman, with light brown, not-quite-blond hair and a healthy, wind-tanned complexion that all the cosmetics in creation could not turn to petal-softness. She also had a pleasant upward quirk to the corners of her mouth and laughter wrinkles at the corners of her eyes. They seemed to belie the anguish she was experiencing. As a woman of fifty-nine she seemed a remarkably well-preserved forty.

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Both the general and the admiral had risen to their feet instantly when the woman entered the room. They would have arisen in any case, but for a Mrs. Barbara Adams their backs were a little straighter and their stomachs a little flatter.

"Barbara—" said Admiral Curtis.

"Mrs. Adams—" said General Tullin.

The woman carefully stripped the gloves from her hands. "Hi, Hy," she said. "General," she nodded. Then she tilted her head and smiled gently. "Don't try to be tactful, Hiram. You're going to attempt to convince me that I'm a silly old woman. And the general already has doubts about whether he's done the right thing." She looked directly at General Tullin. "Please don't have any doubts, General. You're probably only the first in a long, long line." She turned her attention to Admiral Curtis. "And don't waste your time, Hy. I admit it—I'm a silly old woman. Now let's get on with the arrangements for releasing John. I'd like to have him admitted to Sunnyvale as soon as practical."

"It's not practical," said the admiral with compassion.

"One of the advantages of being wealthy," said Mrs. Adams. "I don't have to be practical." She smiled again. "Practicality doesn't demand it. Later on I'll be able to afford Groton for my grandson, if he's ever able to attend. Now I can afford Sunnyvale. If for nothing else, for a whim. It's my money, Hiram."

"I wasn't considering your money," said the admiral.

"I know you weren't," said Mrs. Adams. "Dear friend," she said softly, lowering her eyes. Then she looked up again. "I know your only concern is for me. Just as my only concern is for John. But within bounds! Please believe me, Hy. I'll accept everything you have to say. And I am resigned. And I won't be disappointed, regardless of the consequences." She settled back in the chair and crossed her ankles. "I am not desperate, or frantic, or half out of my mind. And I'm not going to be easy prey for every charlatan who comes along—although I'll probably make a few charlatans rich. I would not be keeping faith if I did not try every conceivable measure in John's behalf. And I'll grasp at straws. Any straws. And that," she said adamantly, "includes African Witch Doctors and Black Forest Satanists. So long as I can afford it, it would be ridiculous if I did not. It would be criminal if I did not!"

"Even when it's hopeless?" asked the admiral.

"He'll never be hopeless," said Mrs. Adams matter-of-factly. "So long as he's alive there's hope." She frowned. "You're not that much of a cynic, Hiram Curtis. And you can't be that sure of your-

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self! I tell you again, I'm not going to destitute myself while some fat fakir gives John harmless nostrums. And flashing lights on weird machines give me eyestrain. If they don't achieve results—out they go. Unctuous words annoy me. But if they do achieve results? Maybe they can't turn John into a human being, but possibly they can turn him from a vegetable into an animal. Even that would be some consolation. And even if they accomplish nothing at all—at least I can know that I've exhausted every possible means. At least I'll have kept the faith."

"Like a crusader sleeping on his sword," said the admiral.

"I'm a battle-hardened veteran," said Mrs. Adams. "I'll sleep by my sword, if you don't mind. No. Seriously, Hy, can't you see my point?"

"Of course I can," said Hiram Curtis. He got up from behind his desk, crossed the room, and took her by the hand. "I actually agree with you. You're doing the only sensible thing. I just had to play doctor for a while, that's all. You know that all I want is what's best for you, Barbara."

"I do," said Mrs. Adams gratefully.

The admiral let go of her hand and started walking to the door. "You two stay here and make yourselves comfortable. There's a bar on the bottom shelf of that medicine cabinet over there, if you'd like a drink." He opened the door. "If you wish," he said before he went out, "I'll have everything taken care of later. Paper work, releases, all that. Tell me where Sunnyvale is, I'll make arrangements to have the boy"—he corrected himself—"John delivered there this afternoon."

"That would be wonderful," said Mrs. Adams.

"Canadensis, Pennsylvania," said General Tullin.

When John Haldane Fitz-Hugh Adams III was four years old he was bitten by a bug. A strange kind of a bug having nothing to do with illness. His grandmother was away in Europe at the time—family business—and John was left with the housekeeper. The housekeeper, Mrs. Thomas Galoway, was a warm and wonderful person. She was the widow of an Adams factory foreman who had been killed, *sans* insurance, at the age of twenty-four. Mrs. Galoway had been with the family ever since.

She was in no way a menial. She was a manager. She was an accepted member of the family. And she contributed a tremendous amount to family happiness and family security. But her contributions were not particularly material. Or mental. So when John Adams was bitten by the bug, Mrs. Galoway did not recognize the fact.

John came home from Sunday School and sat down at the piano to tinkle. This amused Mrs. Galo-

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way. And since he did not tinkle noise-tinkle it did not annoy her. He tinkled music-tinkle, but this was hard to recognize as such, so Mrs. Galoway went about her business of preparing the Family Sunday Picnic.

John used the index finger of his right hand and picked out the melody of *"Ein' Feste Burg."* Then he went on the Family Sunday Picnic. After he came back from the Family Sunday Picnic he had his nap. And after he had his nap he had his wake-up snack. And after he had his wake-up snack he sat back down at the piano, and using the index finger of his left hand he picked out the bass counter-melody of *"Ein' Feste Burg."* Then he put them both together. And in his own small way, since he had never really heard the bass counter-melody of *"Ein' Feste Burg,"* he composed the music for, *"A Mighty Fortress is Our God."*

Martin Luther would not have minded at all.

"But Clara," said Mrs. Adams. "Didn't it seem remarkable to you? Not even a bit?"

John Adams was seated at the piano playing both the lyric and the harmonic of one of the best selling pop tunes of the time. Mrs. Adams' bags were still packed, and her fur coat was lying where she'd dropped it on the stairs. After the joyous reunion, Mrs. Adams had started up the stairs to her room—and John had seated himself at the piano.

"The boy's talented," said Mrs. Galoway shrugging. "It's nothing to make a to-do about."

"Talented?" said Mrs. Adams. "He's four years old! Listen to him! Oh Clara, why didn't you tell me? How long has this been going on?"

"Since before you left," said Mrs. Galoway.

"Not before I left," said Mrs. Adams.

"Then right after you left, I imagine." said Mrs. Galoway.

"Four months," said Mrs. Adams aghast. "But I called every night, Clara, why didn't you at least mention it? Four long months," she said almost to herself. "Oh Clara, why didn't you tell me?"

"Tell you what?" asked Mrs. Galoway. "The boy's not one of them prodigies, is he? I surely hope not," she added sincerely.

Mrs. Adams was torn between anger and amusement. "Clara," she said, "all musicians aren't long-haired foreigners. Some of them don't look like musicians at all."

"Well that's a relief," said Mrs. Galoway.

"Yes, isn't it," said Mrs. Adams with a twinkle in her eye. She turned to her grandson and spoke over her shoulder to Mrs. Galoway. "Please unpack my bags for me, Clara. I'd like to speak to John for a moment."

After the woman had left, Mrs.

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Adams seated herself beside her young grandson. She put her arm around his shoulders and turned him to her. "John," she said as she hugged him, "please listen to me carefully. This is very important. Has anyone been showing you how to play the piano?"

The boy shook his head, no.

"Sure now," said Mrs. Adams, "no one?"

John said, "Honest, Nana."

"Well that will come to a screeching halt," said Mrs. Adams. She hugged her grandson tighter. "That's what your Daddy used to say when he wanted to change something. Double faulting at tennis, or getting 'D's' on English lessons. I'll see to it that you have the very best music lessons in the world. Do you think you'd like that?"

"Gee," said the boy.

When John Adams was six his grandmother changed music teachers. His first teacher had been a gifted woman who had once performed as a soloist with the Chicago Symphony. But she was honest as well as gifted, and she'd said, "Mrs. Adams, I'd like to recommend a change. Quite frankly, the boy has a much greater capacity than I'll ever be able to fulfill." She gave Mrs. Adams the names of several fine teachers in the Boston area and departed from the scene.

When John was seven he learned to play the violin . . . and the tuba. And the bass. And the oboe. And the tympany. And any other musical instrument he could lay his hands on. He did not learn to play them well, but, as his teachers explained, he did not want to play them well. He was only interested in the techniques involved, and what these instruments could and could not do.

When he was eight he composed a fugue. It was very bad.

Also when he was eight he conducted a performance of the Boston Symphony Orchestra. It was very good. He chose the program himself: Gustav Mahler's *"Das Lied von der Erde," "L'Après midi d'un faune,"* by Debussy, and Schumann's *"Rhenish Symphony."* In one sense, the critics were not kind. They criticized. "Too emotional," said one. "Not polished," said another. "Several more years to be truly great," said a third. Almost of a common mind, they'd each preceded their reviews with a short statement to the effect that their opinions were based only on the performance of John Haldane Fitz-Hugh Adams III as a conductor. Nothing else was taken into consideration. His genius precluded any reference to his age.

When Barbara Adams had finished reading the last of the reviews she laid the newspapers thoughtfully aside and put on her coat. Then she went to the door, opened it, and left. She did not confide in Mrs. Galoway. Nor, until her sus-

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picions were confirmed, would she confide in herself.

She immediately went to the offices of Whortleberry, Behrend, Entwhistle & Grace. Fortunately for her own well-developed sense of humor, she did not have to deal with Mr. Whortleberry, Mr. Behrend, or Mr. Entwhistle; Tom Grace was an old friend of the family, and one of Barbara Adams *nee* Scaife's old suitors.

"Tom," she said, after doggedly plowing her way past one receptionist, two secretaries, and the Executive Assistant for Discouraging Public Relations, "I need your help. Urgently."

Whortleberry, Behrend, Entwhistle & Grace, was deliberately the least known and most outrageously priced industrial counter-espionage firm in the field. They were highly respected by those firms which knew of them. And only those firms knew of them with which Whortleberry, Behrend, Entwhistle & Grace wanted to do business.

"And you shall have it!" said Tom Grace enthusiastically. He smacked both hands down emphatically on the top of his desk and started up as Mrs. Adams entered the room. He was a large, rotund, jovial man. A footballer apparently gone to seed who would appear more at home with shares or shoes than shenanigans. But appearances are deceiving. He literally carried Mrs. Adams over to the chair behind his desk and seated her. Then he plunked himself down on a couch. "What catastrophe needs fixing?" he asked with a grin. "Has your hidden past caught up with you? Seems to me the last time we did business with an Adams firm, you had an overzealous janitor who burned up old blueprints when they got discolored."

"Not this time," said Barbara Adams. "It's personal, but it's not my checkered past I'm worried about. Tom, with all your cloak and daggering, how much of the local news do you follow?"

"I read the papers," said Grace.

"Funnies first, I'll bet," said Mrs. Adams.

"Always!" said Grace.

"The society pages?" asked Mrs. Adams.

"Only for grins," said Tom Grace with a grin.

"How about the music news? Entertainment?" asked Mrs. Adams.

"Not enough to please my wife," said Grace. "I don't really have the time."

"Then you know nothing at all about my eight-year-old grandson, do you?" asked Mrs. Adams.

"Noooo," said Grace thoughtfully. "Should I?"

"He has just conducted a performance of the Boston Symphony," said Mrs. Adams. "Not so well as Barber perhaps, but well enough."

Grace looked properly surprised.

"It's surprising to me, too," said

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Mrs. Adams. "Especially since there has never been an iota of musical talent anywhere along the line in our entire family. The Saltonstalls, that's his mother's family, are"—she paused dramatically and wiped sea-spray from her eyes—"Saltonstalls. And there may have been a Scaife who could tootle the flute—I've never been that much concerned with my own family tree to really know—but certainly not well enough to account for John. And the only artistic Adamses that I can find have all been rather pedantic writers. Not a loud tootle amongst 'em."

"So?" said Grace.

"So," said Mrs. Adams. "Account for John."

"Why?" asked Grace reasonably. "Seems to me you have a gifted grandchild. Go be proud."

"He's not gifted," said Mrs. Adams. "He's a genius. And musical geniuses do not spring from nonmusical families. Never!" she added emphatically.

"I don't know that much about it," said Grace.

"I do," said Mrs. Adams. "Fortunately, I am of that generation, and that class, that can have a real love for music, and a thorough knowledge of music, and can talk of music, without having a smidgeon of musical talent. But we're not talking of musical talent, we're talking about musical genius. And without exception, whenever you encounter musical genius, you find a home where music has been the single, most important factor in the environment of the child. Either one or both parents are accomplished musicians, and usually with at least a touch of genius of their own. And most important of all, a musical discipline has invariably been imposed on the child, almost from the time he could walk. None of these factors apply to John. Not one."

Grace assumed an expression of interest. "The deepness darkens," he said wrinkling his brow. "But what are you getting at, Barbara? If you're not suggesting that Dorothy had a liaison with a local horn player, what are you getting at? They stopped mutilating mutants twenty years ago. No atom bomb made your grandson a Beethoven, Barbara."

"I know that," said Barbara Adams. "But something has to account for it. I know that seven years ago I was a desperate old woman clutching at straws. And I know that there weren't any straws to clutch at." She paused thoughtfully. "I'm a successful woman," she said finally. "Over and beyond my husband and my family, I've been successful. And I'm just like any other successful person, any truly successful person. I rely on others. Once I get out of my own field, I find the best I can, and then I believe them. You didn't know that John was once considered hopeless. He was a vegetable, nothing more.

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Utterly mindless. And at the beginning he was at one of the best hospitals in the world; Bethesda, the naval hospital in Washington. They're the ones who told me John was hopeless, and I believed them then. I think I'm beginning to believe them again now. But I was resigned—resigned to not being resigned—and I could see no harm in exhausting every possible resource. I took my grandson to a special home. A special home that I've since tried twice to find and have been unable to contact. It was an institution in Canadensis, Pennsylvania, called Sunnyvale. I want you to find it for me."

"Evans!" said Grace. "Philip H. Evans."

Mrs. Adams looked puzzled.

"Twice," said Grace. "Twice we've been involved with a man who took someone to a special home. Once it was an engineer with a crippled child. He had separated from his wife, she was seeing a man named Evans. There was nothing there and we told him, but he'd separated from his wife. The wife took the child, the child disappeared, and we were called in. Two weeks later the wife had an accident—drove off the Westinghouse Bridge in Pittsburgh. She didn't bounce. About six months later the engineer got his son back, a healthy son, and we were called off the case. After that we didn't get a smell of Evans, and the engineer wouldn't co-operate."

"Have I heard of the man?" asked Mrs. Adams.

"He was a newspaper correspondent," said Grace.

Mrs. Adams looked thoughtful.

"The second case was a weirdy," said Grace. "A top-level physicist contracted Parkinson's Disease. He went away to retire—and eventually to die. About eight months later, the same top-level problems he was working on were published. The problems and the answers were published. When we checked it out, we found the author to be a supposed simpleton who'd gone away for help. His background was a blank. He wasn't the man we were looking for—not the man we thought he was, that is—every government worker has his fingerprints on file. And this man had never been fingerprinted. What could we do?" Grace shrugged. "We couldn't jail him for lying—we couldn't prove him a liar. All we know is that Philip H. Evans was the last man to be seen with our physicist. And the last man to be in contact with our subcretin before he became a genius."

Mrs. Adams was interested. "And?" she asked.

"And," said Grace, "is there an Evans here?"

"Not that I know of," said Mrs. Adams. "A General Tullin recommended Sunnyvale to me. Major General Frederick A. Tullin."

"Friend of the family?" asked Grace.

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"No," said Mrs. Adams. "Well, yes I guess. He said that John—my John—had served under him."

"That makes him a friend of the family?" asked Grace.

"No," said Mrs. Adams. "Yes!" She smiled faintly. "I doubt if you'll find anything *sub rosa* about Fred Tullin," she said. Then she paused. Barbara Adams had knocked about enough in this world not to be surprised when nice people turned out to be not-so-nice. "I'm not morally certain, but I'm pretty sure that Frederick Tullin is an honorable man. I was introduced to him by Admiral Curtis, and I am morally certain that Hiram Curtis is an honorable man."

"Honorable is a tricky term," said Grace. "All it really means is being true to your own set of ideals. Not necessarily the ideals of others. Yours or mine, for instance."

"Then you think that this is allied with your other cases?" asked Mrs. Adams.

"I don't have the slightest idea," said Grace. "But the circumstances appear the same. How about this Admiral Curtis or this General Tullin? Can't they tell you where Sunnyvale is now?"

"General Tullin has been retired. I was unable to contact him," said Mrs. Adams. "And Hiram knows no more about it than I do."

"Then we're deadended," said Grace.

"Does that mean you can't help me?" asked Mrs. Adams.

"Oh no," said Grace. "Hell no! The third time's the charm. Evans or no Evans, I'll find your Sunnyvale for you. It may not be the one I'm looking for, but I'll find it. And that's a promise!"

"All right," said Grace eight months later. "I've kept my promise. I've found our Sunnyvale." He did not tell her where it was.

"Ours?" said Mrs. Adams.

"Ours. Theirs," said Grace. "But it's the one we've both been looking for. And it was a job and a half, believe me. I didn't think I was quite that good." He did not tell her how he had found it; the pressures he had had to resist, the pressures he had had to bring to bear.

"Your Philip H. Evans?" asked Mrs. Adams.

"And your Frederick A. Tullin," said Grace. They were seated in the offices of Whortleberry, Behrend, Entwhistle, & Grace. Tom Grace walked over to his desk and flicked a button on the intercom. "Bring me in a bottle of Jameson's," he ordered. He turned to Barbara Adams. "All private detectives are expected to keep a bottle of hootch in their desk drawers."

"You'll have to let me take my time with this report, Barbara, I'm still a little awed." Grace paused thoughtfully. "I'll tell you most of what you want to know, but I won't tell you the where or how of Sunnyvale—some of the who you already know—and as for the what

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and why, you'll have to draw your own conclusions, just as I have. But I can't make a value judgment on these people, Barbara. I can't say they're wrong, any more than I can say they're right."

The door opened softly and Grace's secretary entered bearing the bottle of Jameson's. "Irish ambrosia," said Grace. "Want one?" he asked Mrs. Adams.

Mrs. Adams nodded her yes.

Grace poured drinks for both of them, handed one to Mrs. Adams, then carried his to the farthest corner of the room and seated himself quietly in a corner chair. He stared at his drink. "These people are, in essence, playing God. And I'm religious enough to think it wrong." He swallowed his drink. "And I'm irreligious enough to think that religion doesn't have a thing to do with it. I don't know how you think, Barbara, and that's what holds me up. Until I can judge your reaction properly, I'll tell you nothing more than who your grandson is. This may not be the proper approach, but I can't bring myself to judge these people."

"Quite obviously you already have," said Mrs. Adams. She was strangely calm. "From your attitude I'd say that whatever these people are doing is illegal. You know it—and can prove it—and yet you have done nothing about it. That can only mean that you must sympathize with them." Mrs. Adams paused, sipping her drink more as a way of gaining time than anything else. "I'm not a purist, Tom. I don't think this makes you a party to their crimes. But I do think it means that you approve of them. I think you should be honest enough to admit it."

"I can't say that," said Grace. "The concept is horrible, and yet . . . ? They are producing worthwhile people for a world that needs worthwhile people."

"And useless bodies that are conveniently stashed away?" asked Mrs. Adams.

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"No!" said Grace. "No, that is not true." He had almost accepted the fact that Mrs. Adams knew of what he was speaking before he had made his report. "I've accounted for every person who has ever entered Sunnyvale. They do switch bodies, but they do not switch lives. Nothing is ever thrown away. Nothing! There's no loss in that place, Barbara, only gain. And I say again, I can account for every person who has ever entered Sunnyvale."

"Oh, nonsense," said Mrs. Adams. "I know you're good or I wouldn't have hired you. But you're not that good."

"I am that good," said Grace. "I'm fantastic! And some day I'll tell you about it. But right now, wouldn't you like to hear my report?"

"I've always had an overactive imagination," said Barbara Adams. "But something tells me that this time everything I've imagined is true."

"That your grandson might have a different mind?" asked Grace.

"Someone else's mind," said Barbara Adams. "Does he?"

"Would it make a difference?" asked Grace.

"He's my grandson," said Mrs. Adams. "From his flat little tummy to the way he giggles when Mrs. Galoway crosses her eyes."

"All right then," said Grace. "Ninety per cent of him is John Adams—or will be. The head is only about ten per cent of the body in an adult."

"And the other ten per cent?" asked Mrs. Adams.

"Is named Mancuszo," said Grace. "Johann Casadesus Mancuszo."

"Two Johnnies!" said Mrs. Adams." How wonderful."

"Barbara—?" said Grace.

"I think it's wonderful," said Mrs. Adams forcefully. "I am not shattered, or bewildered, or shocked, or being sarcastic, or anything else. I think it's wonderful. Please tell me the rest."

Grace told her the rest.

"When he's eighteen, I'll tell him," said Mrs. Adams. "And I'll have his name changed. But I don't think that I should do it now. I don't think it would be fair to John. Do you agree with me, Tom? And will you keep this confidential until then?"

"Of course I'll keep it confidential," said Grace. "But do you think that you should tell him? Even then?"

"Of course I'll tell him," said Barbara Adams, amazed that Grace should ask. "He has the right to know."

When John Haldane Fitz-Hugh Adams III was eighteen his grandmother had his name changed legally. He became, at her insistence, John Mancuszo Adams I.

Later on in life he would hyphenate the name. ■

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UNTROPY

CHRISTOPHER ANVIL

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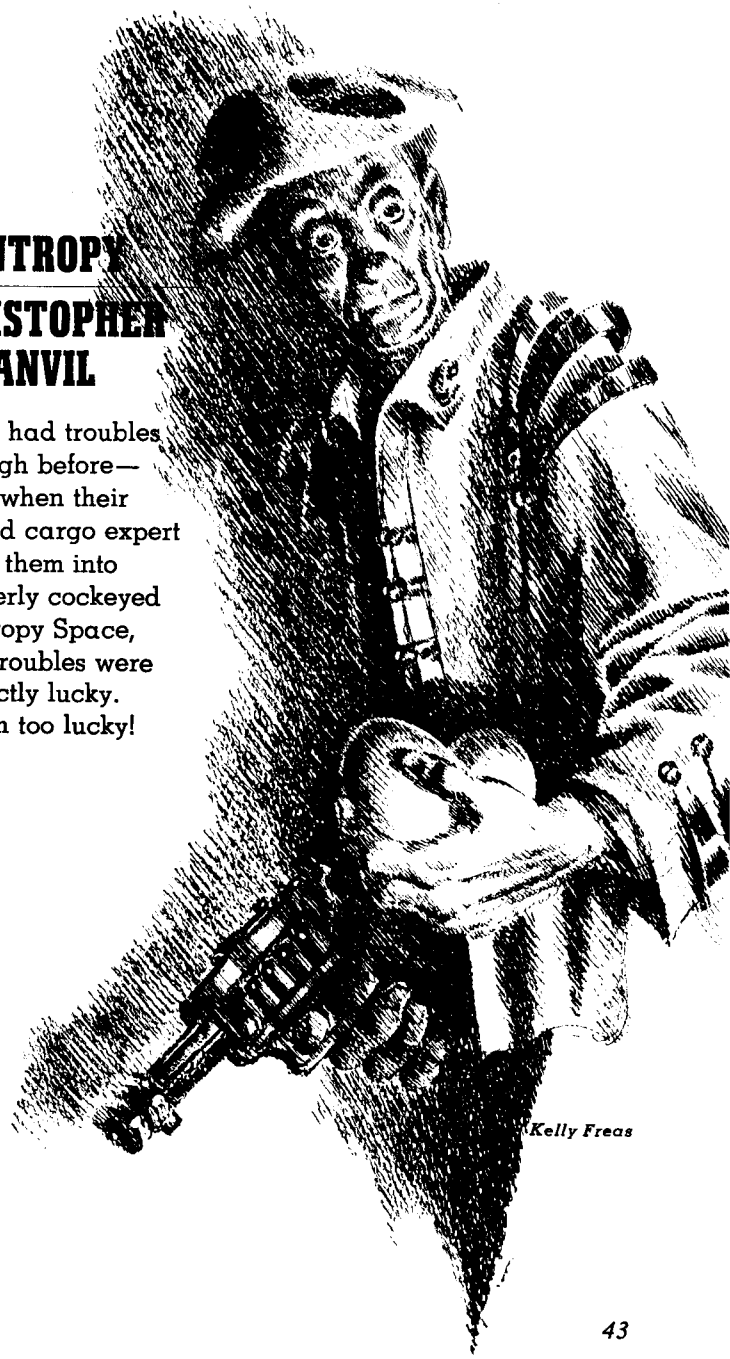

Kelly Freas

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9/26/97

Dear Sam:

As you'll see from the return address on the message spool, I am not writing this letter from any place you'd be expecting me to write it from, and as you'll see from the date above, I am writing it a little later than I thought I would. But I'm writing it, Sam, and let me tell you, that's a lot more than I expected to be doing just a little while ago.

As you remember, the last time I wrote was to tell you about that mess we got into trying to deliver fifty live banjo-birds, each of which weighed around sixty pounds, from a frontier planet called Poverty to another carrier who would deliver them to a research outfit on Ultima.

What with their spurs, claws, hooks, bad dispositions, and two-foot long, needle-pointed beaks, these birds proved to be quite a problem. The contract was filled with strict requirements and heavy penalties; one of the birds rammed his beak through our cargo-control man; and then our captain, who had just completed his time, chose to retire onto a nearby colony planet.

This left us stuck with these fifty birds and the contract, with no cargo-control man and no captain, and with the Old Man back at company headquarters breathing fire and impatiently eying the schedule.

Then, when we did manage to locate a retired cargo-control man on a colony planet, he turned out to be a shifty-eyed individual with a long record of disasters, and all told, he scared us worse than the birds.

As for a captain, that, in theory, was duly provided for in the regulations. I was first officer, so the captain's retirement automatically made me acting captain. Unfortunately, so far as having an *actual* captain was concerned—Well, most of the men we have for officers and crew got recruited from colony planets, where they grow up rough, tough, and independent. You don't impress them much with little brass insignia. They look to the man behind the symbol. And they all knew I was *really* Al, the first officer and not the captain.

The result was, I still got the same respect as before, with a little bit added because on paper I was now top dog, and with a sizable chunk taken away, because the captain, the *real* captain, wasn't here now to back me up.

If you've ever been in this spot, Sam, you know it doesn't take long to get pretty tired of it.

Well, one thing led to another, till it dawned on me that we were right next to running the boat on a committee basis, with each and every committee member having his own private veto. There's not too much first-hand information on how this committee system of running a ship turns out, because it's not too often any survivors of it

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ever come back alive. It's sort of like the question whether you feel any pain when you blow your brains out. There's not much really reliable first-hand information on the subject.

Before we found out the answer for ourselves, it happened one day that "Hook" Fuller, now acting first officer, was in my cabin with me, resting up after a bout with the birds. Pete Snyder, acting second officer, and Ace Bartry, acting third officer, were there, too, everybody sprawled around wondering how we were ever going to get out of this mess in one piece. Now, as it happened, I had this unreliable cargo-control man locked up in the captain's cabin, because it was roomy and had its own toilet, and the fact of this Jonah having the captain's cabin grated.

Pretty soon, right there before my eyes, the committee system went to work to decide where to stick the cargo-control man, and in the process, good old Ace said some things it was O.K. for him to say to his pal, Al, but that weren't so hot for a third officer to say to any ship's captain anywhere, acting or otherwise.

I don't know, Sam, if you ever heard of Iron Fist Karmak, but I served under him once, and I made the mistake one time of arguing a point when the right thing was to say "Yes, sir," and go do it.

Iron Fist Karmak then made a little speech. It was one of those that burns itself into your memory in letters of fire, and that you can really remember afterward, because you wake up nights with it running itself over in your head. Even yet, I still wake up sometimes in a cold sweat, saying "Yes, sir. I will, sir." Then it takes a little while to get unstuck from that speech and come back to the present.

What I'm driving at, Sam, is that I didn't have any trouble remembering that speech. It presented itself to me, ready-made, when Ace Bartry disputed my arrangements for running things, and then, since there was not another thing I could have done to straighten the mess out, I let Ace have that speech, right between the eyes.

When the smoke and dust cleared away, and Ace swallowed hard, and said "Yes, sir. I will, sir," and saluted and stumbled out of there, the overall ricochet, fragmentation, and general shock-effect of that speech brought Pete Snyder to his feet as if he'd been lifted up by the back of his neck, and he excused himself and cleared out, too.

This only left "Hook" Fuller, the acting first officer. I was afraid maybe I'd overdone the thing, and now I wouldn't have anyone to talk to, but Hook only grinned, and wanted to know where that speech came from.

Well, I was telling him, and we were congratulating ourselves that maybe things would run smoother now, when a crewman came rush-

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ing in and said the cargo-control man was in the cargo section, and had ordered all the birds unstrapped so he could carry out an inspection of the anesthetizing equipment.

Sam, nobody could describe the scene in that cargo section. Luckily, only about a dozen of the birds were actually unstrapped before the first one woke up and took off after the cargo-control man. By the time we got there, there were eight of them after him, and he had the interstellar sprint record sewed up tight. I could tell you, I suppose, how we finally got the birds off him, how we distracted them while we stuck the boob in the spacesuit locker to keep him out of the way, how we finally got the precious birds strapped back in their anesthetic couches, and then how—drenched in sweat, and with the deck seeming to rise and fall around us in waves—we stood there and heard the insane raving of this cargo-control man, who was having some kind of megalomaniac seizure right there in the suit locker, and was threatening us with all kinds of punishments because we'd interrupted his inspection.

I *could* tell you, Sam, but you already know all about those birds, anyway. And every time I think about that scene in the cargo section I can hear the blood start to roar in my ears, and see the incandescent spots dance before my eyes, and I'm not so sure I want to relive that part of it for a while yet.

Just take it from me, we were in a rare frame of mind by the time we got this raving cargo-control man crammed into a suit that was free of beak-holes. We got the faceplate on, then we bundled him out through the cargo-section air lock and onto the net. This sobered him up pretty fast, maybe because it occurred to him that all we had to do to get rid of one of our troubles was to give him one good shove. In any case, when we got him inside the ship and dragged him out of the suit, he'd stopped raging, and we had the shifty-eyed hangdog boob who'd signed on in the first place.

After this experience, we naturally expected every imaginable kind of trouble getting past that one subspace jump that remained between us and transfer of the cargo. So we put a couple of big bolts on the outside of the cabin door, and kept the cargo-control man locked up tight in there, with a guard outside keeping track of him, and we didn't let him back into the cargo section until just before the jump.

Hook and I got him alone before he went in, and we put it to him in little words just what would happen if he tried what he'd done the time before. We went into the cargo section with him, along with the better part of the crew, which was split up into squads and all set for anything.

While we were all on our toes, set for the worst, the cargo-control

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man carried out a kind of half-hearted inspection, shrugged, and signed the necessary papers. The instant he finished signing the papers, Hook, who was taking no chances, reached over with a length of pipe and laid him senseless on the deck. We got him out of the cargo section, back into the ship, and locked in his cabin. Then we stared at each other.

This seemed to end our problem.

We felt like people who'd been all set to lift the three-hundred pound weight, and it turns out to be just hollowed-out balsa wood, weighing six ounces.

We should have been relieved. Instead, things seemed to get out of proportion, and we had to remind ourselves that the business wasn't over yet. We still had to make the actual subspace jump, and then connect up with the other carrier.

The jump was no trouble. And when we finished it, there was the steady beep of one of the other ship's signal beacons, telling us everything was in order. In a little while, we'd be in contact with this other ship, which was named *Starbright*. It all seemed too easy.

About this time, Pete Snyder came in carrying a little flat brown bottle, and showed it to Hook. After he'd questioned Pete for a while, Hook handed me the bottle.

"Ace is with the cargo-control boob in the library. While the cabin was empty, Pete went through it and found this."

The crisp, neatly-printed label on the bottle read: "o-Amino-p-sugadeine (2,3,4-tribaloate)-quinquigesimophenoleine." While I was mentally groping around, trying to figure out what this might be, it dawned on me that under this were a couple of other words, in very fine type. I took the bottle over to the control console, where there was a better light, and managed to read it:

(Purified Hopweed)

I looked around. "Pete found this—"

"In the cargo-control man's stuff."

"And he's where?"

"Library."

On this trip, the ship's library had gotten so little use I'd forgotten we had one.

"What's he doing in there?"

"He says he wants to change his specialty. He's studying up on navigation. He says that being a cargo-control officer has led him astray and he wants to return to the true path."

I got hung up for a few seconds trying to figure out the reasoning behind this, but finally managed to get loose. "And where was this bottle?"

"His bunk mattress was cut open at the top, along the edge. Pete says there were half-a-dozen of these in there."

Hook and I stared at the powder in the bottle. Hook looked up.

"What do we do?"

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"Better have Pete put this stuff back with the rest. Have him try to fix the place it was in so it won't look like anyone's gotten into it. We'll figure this out later, after we get rid of the cargo section."

Hook nodded, and the communications man said, "Sir, the captian of *Starbright* wants to talk to you."

Naturally, he would. The cargo remained technically our responsibility till *Starbright* had the cargo section. While *Starbright* couldn't actually escape the terms of the contract through this technicality, they could stretch them considerably. If any of the birds, for instance, were a trifle sickly, *Starbright* could suffer a series of unfortunate accidents that would so delay transfer of the cargo section that the sickly birds would have time to weaken and die—with us. Then *we* would get hit with the penalty, not *Starbright*. There were quite a few variations on this idea.

"O.K.," I said, "but let's have a short-focus transmission." Nearly everyone on the ship was bandaged up, and it seemed just as well not to advertise this fact.

The communications man said, "Short-focus transmission. Here you go, sir."

The screen lit up to show a sleek-looking officer with every hair in place, uniform fresh and crisp, and insignia glittering.

"Omark, Captain, T. S. M. *Starbright*. Central Transportation Lines, Incorporated." There was that about his smooth tone of voice that suggested the purr of a large fat cat eying a canary.

Across the control room, Hook shut his eyes.

Starbright's captain came to the end of his introduction, and stood there looking superior, smug, and completely in control of the situation.

Well, as you know, Sam, in our outfit, we don't go for this superior-attitude stuff. We have *other* methods.

I looked at him on the screen for a while, as if I were looking at some weird kind of bug. Then I said, "Do you know what you're getting into, Omak?"

"What's that?"

"This is a tough cargo."

"What's wrong with it?"

"I don't know as there's anything wrong with the *cargo*. I'm just wondering if *you* can handle it."

This brought him halfway down off his perch, but he was back up on it in a flash.

"An inspection crew will be alongside your boat in twenty minutes. See that the cargo doors are opened at once, or you may suffer some unexpected delays."

His face registered untouchable superiority, but he already had one foot in a trap. I looked at him, and he sighted down his nose at me. Then I let him have it.

"Before you dish out the next threat to hold us up, Omak, remem-

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ber that the Commission frowns on these artificial delays. This conversation is being recorded." Of course, he should have avoided this obvious mess. But he had gotten irritated.

His expression showed that he knew trouble when he saw it. To paste over the hesitation, while he groped for a way out, he said, "My name is *Omark.*"

Naturally, I knew his name. But the idea was to get him mad.

"I'm not worried about your name, Omak. I'm wondering if you can handle the cargo. Do you know what it is?"

"Certainly. It—"

"And no inspection crew is coming aboard this ship, Omak. You can send a cargo-control man and one other into the cargo section. Or you can look yourself."

The look of anger that went over his face was real now. He glared out of the screen.

"Listen, you—"

"Have you considered subcontracting this job? We might run it the rest of the way in, for a price."

The last of his air of superiority evaporated into raw anger. "Listen, you outplanet junk-jockey, we've handled tougher cargoes than you ever heard of. No, we *won't* hire you to run it through for us." He turned away from the screen to bark orders, then looked back, "Cast it off, and get out of our way."

He had now said the words. But it wouldn't hurt to reinforce them.

"If you want it that way—"

"That's the way it's going to be."

I let a look of imitation respect seep onto my face. "As you say, Captain Omark." I turned to Hook, who was out of range of the screen and grinning from ear to ear. "Cast loose the cargo section!"

Hook left the control room in a streak.

I turned back to the screen, where *Starbright's* captain now had a faintly bemused look on his face. It had evidently just occurred to him that there was a price on his having the last word. He was accepting the cargo section as it was, with no inspection at all.

"Ah—" he said, "the cargo—"

I tried to look friendly and considerate. If I remembered correctly, he had said, "Cast *it* loose," not "Cast the cargo section loose." If he thought of this, he might worm out of it yet. But once his men actually took charge of the thing, he was stuck with it.

"Captain," I said considerately, to get him off on another track and pass a little time, "to the best of my knowledge, one of the birds may be slightly lame. You may want to check the contract, but I believe—"

Hook's yell echoed up the corridor.

"Cargo section loose!"

To get rid of it that fast, they must have cut the cables, and left the crew men in the cargo section to get back on hand-jets.

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I said, "Captain, my crew is very experienced in handling this sort of thing. They've already cast the cargo section loose for you. However, if you'd like to reconsider, and want to change your mind about contracting with us to take it back for you—"

He had now been formally told that the cargo section was his. Failure to object to this would constitute "tacit acceptance of responsibility" for the cargo section.

He said irritatedly, "No, we can handle it."

The thing was now officially his.

There would be no point trying to describe my feeling of relief, but Omark plainly caught it. He was now completely down off his pedestal, and wide awake.

He said shortly, "What's wrong with the cargo?"

"I haven't said there was anything wrong with it. I've been trying to tell you, it's tough."

"What do you mean?"

It was easy enough to answer that. As I described the birds' build, their hooks, claws, spurs, bristly down, rough quills and long sharp beaks, a look of comprehension began to dawn on the face in the screen.

"Maybe we *should* have subcontracted with you."

I smiled. "That offer is now officially withdrawn."

"I'll bet." He laughed suddenly, then shrugged. "Send a man over with the papers, and we'll get started. This is the kind of haul where *we'll want to break speed records.*"

Half-an-hour later, all the formalities had been gone through, and we were congratulating ourselves that, at last, we were completely free of the birds. We'd been in a nasty spot, but we'd come through.

We were so relieved we felt dizzy, and went around cheerfully hammering each other on the back.

I don't know just what it is, Sam, that makes a man forget, when things are going well, the fly in the ointment that was obvious enough beforehand.

Anyway, Hook and me, along with Pete, wound up in my cabin, shaking each other's hands, congratulating ourselves that our troubles were over, and passing around a flask of Supernova Bottled Food Drink. They make this, you know, on Hyperion, where they have a strict prohibitionist government, and about fifty per cent of the planetary revenue comes out of "condensed high-energy liquid food-products." I guess if you run an acre of New Venusian rockwheat through a still and bottle it, you could call it that, all right. Anyway, we had several cases of it on board.

Well, the Supernova Bottled Food Drink was running pretty low, and the ship's officers present were worth around two cents a hundredweight, when there came a pound of feet outside, and Ace bolted in.

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"Al . . . I mean Captain . . . the Jonah's taken over the control room!"

Iron Fist Karmak would have ended this in about fifteen seconds. But then, Iron Fist Karmak would never have filled up on Bottled Food Drink with the trip unfinished. While I was cursing myself for forgetting I was supposed to be captain, and struggling to get some idea through the haze of Food Drink, Pete rose slowly up off the deck, looked at Ace gravely, and fell forward on his face.

Ace said anxiously, "What do we do?"

"How'd it happen?"

"He came in with his uniform all neat and his brass polished, and a fusion gun in one hand, and told us he was taking over under Article 66, Captain Disabled or Lost Overboard, and said, on top of that, this was now a cargo section under Article 17, Definition of Relative Terminology, and to prove it he showed us two things like oversize duck eggs and said they'd hatch out into banjo-birds. Therefore, we were transporting banjo-birds, and under the contract they had to be transported in a cargo section, so therefore this was a cargo section, and he was in charge of the cargo section."

Hook was lying flat on his back on the bunk, and had hold of it with both hands to steady himself. He was listening with an intent look except that now and then the pupils of his eyes took off and went around in circles and he almost fell off the bunk. He cleared his throat.

"Doped up. Hopweed."

I nodded. Obviously, that must be it. I glanced at Ace.

"He make any change in course?"

"Sure he did!"

"How? What did he do?"

"I don't know. I was face up against a bulkhead with my hands back of my neck."

"How'd you get loose?"

"He decided it was time for me to go off-duty."

Time was passing. I still hadn't thought of anything to do, but just then the tail-end of an idea went past, and if it hadn't been for the food-drink, I could probably have ended the mess right there. As it was, I could only grope for the idea.

Ace said urgently, "What are we going to do? We can't leave him there! He's setting us up for a jump."

Hook swung to a sitting position. "Can't jump here! This is uncharted!"

"What do you mean, he can't? He's going to! You can jump anywhere. The only difference is, we don't know where we'll come out!"

"Well, that's it! You could come out in a sun, or in some God-forsaken place. Only a madman or a hopped-up dope-fiend would—"

"What do you think this guy *is*?"

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There was a silence during which we should have been thinking. Again, I almost had it, but then the food drink went to work, and about all that came to me was that this was unfair, it wasn't right, it—

Before I started babbling about this, and maybe getting out a handkerchief to cry into, I said, "Take hold of my arm, Ace, and lead me down the corridor to this bird's cabin."

Ace did as told, and we caromed off the bulkheads to the boob's cabin.

"O.K.," I said, "see if the stuff is where he had it before. That powder in bottles."

Ace got on the bunk, yanked back the pillow and the covers, and felt around the side of the mattress. "It's here."

"Get the bottles out of there and hide them. Then wait in here, and when he comes back in, knock him senseless."

"O.K. But—"

"Before you do that, aim me down the corridor toward the control room. Just get me headed in the right direction."

"He'll kill you, Al."

"Never mind. That's my worry." I still didn't have any idea what to do about this mess, but I had to do something.

"What are you going to do?"

"How should I know?"

"But—"

"If I stay here, I'll pass out. Come on. Move."

"I don't know. It seems to me he'll just shoot you."

I let Ace have a few selected lines from the little speech I'd given him before, and his face changed color.

"O.K., then. I mean, yes, sir." He aimed me toward the control room. I *still* don't see what you can do."

"Never mind that. This is what Iron Fist Karmak would do."

Ace said, in a peculiar voice, "Who is—" Then he gave it up. Anyone can stand only so much in any given length of time.

On the way past my cabin, I shoved the door open and spotted Hook, who'd evidently just finished dousing himself with cold water.

"Next time," he said dizzily, reeling across the deck toward me, "let's get some better brand. There's something about this Liquid Food Drink—"

"Like what?"

"I don't know. Wormwood, maybe."

I dragged my mind back onto the subject. Abruptly the idea came to me.

"Reach into my locker beside the bunk there, and get out the hypo gun we used for that load of zoo specimens. It's in the corner, on the right."

"That's too good for him. We ought to blow his head off."

"The trouble is, right now we might miss. Then where'd we be? Get that gun."

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Hook nodded. "This boat has a fairly thin hull, doesn't it?" The door of the locker clattered back, and in only two or three grabs, he had the gun. "Here it is. I hope it's loaded with—"

Just then, with both of us just starting to come back to our senses, there was a kind of twitch, a sort of sudden readjustment, and although everything looked the same, something was different.

". . . Cyanide," said Hook. He handed me the gun, and said bleakly, "He did it."

I took the gun. One thing about this outfit, the Old Man insists on the best equipment for making subspace jumps. There was just a trace of that queasy nauseous sensation.

"Come on," I said. "The two of us ought to be able to take him."

"Sure," said Hook. "I feel like half a man, anyway."

We groped our way down the corridor, and were almost there when there was a sort of twitch, a kind of unexpected readjustment, and the consciousness of a sudden change.

Hook caught his breath, and I stood paralyzed for an instant.

He had done it again. Now, had he jumped us back to where we started from, or—

Around and through us, there was a kind of twitch in the fabric of things, an unexpected rearrangement, and a sense of displacement in some indescribable direction.

A *third* jump!

Before anything else happened, I stepped into the control room, already squeezing the trigger of the hypo gun.

On about the fourth or fifth shot, I got him.

As the cargo-control man landed full-length on the deck, Hook staggered in, cursing.

"That last one was a long one."

"He was all set for another. Now, I wonder just where the Sam Hill he's landed us."

I hit the Astroposit button, and there was a long silence as the device compared local stellar patterns with known stellar patterns, and tried to find a match. At length, a strip of paper tape unreeled, and I tore it off anxiously.

POSITION UNKNOWN. SITUATION HIGHLY ANOMALOUS.

Hook swore. "I didn't even know it knew that word."

"Probably it never had reason to use it before." I glanced at the outside screen, and hit the wide-angle button. For just an instant, I stared at it, and couldn't believe what I saw.

"No," said Hook. "It can't be. It's the liquor."

"No, it isn't." Not even Supernova Liquid Food Drink could have done that. We had to find out, so I hit the Tridem Visual Display switch.

The control-room lights faded out. Around us, like shining points of light, appeared the three-dimensional image of the stars outside.

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These stars were all of the same brightness, evenly spaced, in a regularly-repeated pattern.

In about half-an-hour, Hook and I had the cargo-control maniac strapped to the bunk in his cabin. Ace, tense with the knowledge of the number of jumps that had been made, almost brained us as we came in, but that seemed like a small matter. Hook and I were cold sober now, and when we brought Pete Snyder around long enough to see that stellar pattern, all of a sudden he was cold sober, too.

"My God," he said. "What is this," he demanded. "A joke?"

Nobody said anything, and Pete burst out, "There isn't any place like this!"

Hook said, "Think back. We've got a Jonah on board. He got control of the ship, and took three jumps."

"We've got to backtrack!"

We snapped the lights back on, and looked at the console. There were the subspace-jump master-control levers:

Recon. OFF
A.C.C. OFF
Monitor OFF
Memory OFF
Manual ON

Pete said in a whisper, "There's no record." An instant later, he said, "Maybe he just repeated."

"Nuts," said Hook. "The first two were different from that last one."

"If we could figure back from what he's got on the board—"

"No," I said, pointing to the automatic-reset switch. "That doesn't prove a thing. The board cleared itself after each jump, and he was setting it up for another jump just as I got in here."

Pete was staring into the outside screen. "There's no place where the stars are spaced that regular. There *couldn't* be."

Ace was looking at it, too, not saying anything. Then Pete said, in a shaky voice, "This place is different."

That sounded like the number one moronic comment of the year, but he had a point. There *was* something different in the feel of things—but it was hard to pin down just what it was. On an Earth-type planet, there's a different feel on a warm spring morning than there is on a crisp fall day. It's possible to pin down the reasons for that difference. This feeling was harder to pin down, but it was there just the same.

Ace nodded. "Something . . . something different. Let's turn that screen off."

I switched it off, but the peculiar sensation remained.

Hook snorted. "Between the local absinthe, the cargo boob, and that sight outside, it would be a wonder if we didn't feel funny. Let's get some sleep. At least the boob didn't land us inside a sun. Come on, tomorrow's a big day."

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Hook's voice sounded a little strained, but he was moving in the right direction.

"Good idea," I said, "Let's go."

I started for the corridor, and the others followed.

We muttered dazed good nights to each other, and headed for our separate cabins. I didn't know about Hook and Pete and Ace, but I could feel those regularly-spaced stars looking at me right through the hull of the ship. I lay there for a while, face-to-face with the impossible, then rolled over and tried lying on my side, then on my back. It didn't help. I had such a vivid mental picture of those stars that we might as well have had a transparent hull. I glanced at my watch, and saw it was 0245, shiptime. Just then, there was a quiet tap, and I sat up.

"Who is it?"

"Hook."

"Just a minute."

I got up, snapped on the lights, and Hook came in, lugging the mattress off his cot and a pile of blankets, which he unloaded onto the deck. He said apologetically, "I keep seeing those damn stars, lined up for parade. There's something else, too." He flattened out the mattress and got the blankets where he wanted them. Then he whacked the pillow with his fist and lay down. "That cargo-control moron. Did you see how he landed, Al?"

"What do you mean?"

"When you shot him and he fell."

"He went down the way you'd expect if he was somebody kidding around. As if someone were to keep his feet together, lean, and start to fall. Only he wasn't kidding, so he went all the way, full length."

"Did he look natural to you?"

I put the light off and settled back into my bunk. Now that Hook mentioned it, there *had* been something weird about the way he fell. Then I shrugged. "To begin with, he was doped up. Then I shot him with a hypo-gun. Naturally he didn't fall the way you might expect."

Hook sighed. "Turn the light on, Al." There was a tinkle of coins.

By now, I'd forgotten my own uneasiness, and was beginning to feel puzzled. I snapped the light on, and looked around.

Hook tossed a small handful of coins into the air.

I watched exasperatedly, "What's the idea? Are you out of your—"

But by then, all the coins had hit the deck, and formed a nice neat pattern, the largest coin in the center, and the smaller ones alternated in a circle around the outside.

While I stared at this, Hook said, "When that cargo-control man fell, he started to reach back with his hands to break his fall, but then he passed out completely. He ended up flat on his back, with his body in a straight line, both arms out and the fingers spread wide. You could have run an upright mirror down the center of his body and never have noticed the difference. One

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side was in exactly the same position as the other."

Scowling, I said, "Let's see those coins."

Hook gathered them up, and handed them to me. I shook them up, and tossed them. They came down with the largest one in the center, and the others spread alternately around it, larger and smaller, to form the outline of a stylized, sharp-pointed star.

I looked at this for a while, then stared off into the distance.

I looked back, and there the coins were, still in the same pattern.

I took the coins in one hand, and instead of tossing them up, swung my arm slightly down, so as to scatter them in a rough line.

There was a clink and clatter as they hit, and then there they were.

The large coin was in the center, the others alternated in a long ellipse around it.

I shut my eyes, looked again, then got up and felt of the coins. Next I had Hook describe their position. It was exactly as it seemed to be. The coins, of themselves, had fallen into another regular pattern.

Hook said, "The odds against a thing like this are—" His face took on a peculiar expression. I guess he was trying to figure the odds, and couldn't keep track of all the zeros. "Well," he said, "the thing is *impossible*, that's all. When improbability reaches a certain point—"

"No," I said, "that's where you're wrong. No matter how improbable a thing is, that doesn't make it impossible. If you've got a hundred billion white marbles, and one blue marble, you might still reach in some time and come out with that blue marble."

"Yeah, but if you've got a hundred trillion trillion to the quintillionth power to the—" He went on adding powers and multiplying till he had to take a fresh breath. "If you've got *that* many white marbles, and just one blue one, *then*—"

I shook my head. "I sure wouldn't want to bet on getting it out of there. But as long as that one blue marble is in there, there's nothing impossible about reaching in and coming out with it."

"But the odds—"

"The odds are for betting, so you can judge what's likely over a long period, when everything averages out. The odds don't mean a thing on one single throw."

Hook looked unconvinced. I said, "There's a casino on Tiamaz, where one of the tables has a game played with seven wheels. Each wheel has sixty-four numbers, plus a zero. The numbers are alternating red and green. The zero is black. The rules of the game hold that if the little silver balls, and the golden ball of the master wheel in the center, all settle on zero, the player loses not only what he's bet, but everything he owns. Now, you figure the odds on *that* happening.

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But that's the rule, and on that planet, gambling losses are legal. Well, I was in there one night, just watching, when a married shipmate of mine, with a big ship-savings account, got into the game, just so he could say he'd played it. He no sooner got started than the number one wheel came to a stop and the little ball settled on zero. Then the next wheel stopped, and the little ball rolled on to sixty-four, then fell over onto zero. Then another wheel stopped, and the little ball settled on zero. Then another wheel stopped, and the little ball tipped off of number one, rolled onto zero, rocked back and forth and settled down there.

"Well, my shipmate was sitting there, gripping the table edge, moving his lips in silence, and dripping sweat onto the green cloth, as one by one the little balls stopped on zero. Then the last wheel came to a stop, and the last little ball rolled slowly around, and settled on number two. My shipmate shut his eyes, got up, slowly walked out, and I'd like to ask you the odds on what he'd tell you if you told him something can't happen because *the odds are against it.*"

"Hm-m-m," said Hook, and thought that over.

The saying has it that "Seeing's believing," but I don't know. The stars were right out there to look at, and there lay the coins on the deck in front of us; but here we were, arguing about whether it was *possible,* because it didn't seem *reasonable.* And it didn't seem reasonable because we hadn't ever seen it before. Maybe that saying ought to be, *"Habitual* seeing is believing."

"Well," said Hook, "I . . . I see you've got a point. But how do you explain a thing like this?"

I looked at those coins lying in a nice regular ellipse, and wondered how anyone could possibly explain a thing like that. On the other hand, it *had* to be done. If we couldn't explain it, we were going to be in a first-class mess tomorrow, as soon as the crew discovered what was outside.

Well, the wispy end of a thought occurred to me, and I started reeling it in, talking all the while to see how Hook reacted to the idea. He lay on his mattress with one elbow on his pillow, listening intently, while disbelief and hope flickered alternately across his face. Then suddenly he began to nod.

"That's it. You've *got* it, Al!"

The explanation satisfied him so well that he grinned, got up, and said, "Now I can sleep." He agreed when I insisted that he keep quiet about the coins, then went off down the corridor with his mattress and blankets, and I turned out the lights, lay back down on my bunk, and fell asleep. My last conscious thought was that I was going to have to give that explanation to the entire crew tomorrow, and somehow convince them.

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Otherwise, we might have a mutiny.

Well, the ship's chronometer crawled around to what would have to serve us as dawn, and one thing led straight to another till there I was, talking into the ship's public address system. Word had gotten around pretty fast after the first glimpse at what was outside that thin hull.

"Men," I said, "as you've doubtless learned, we have a unique scene outside. Few if any other crews have ever had the chance to see this. What we see out there is nothing less than a complete reversal of the usual rule of Nature. The stars out there are not strewn around in random disorder. In this region of space, disorder is *not* the rule. You have only to look to see the proof of this."

"Experience," I went on, "teaches us that whatever a man tries to do, Nature will try to undo. If he builds a house, Nature will immediately go to work to level it. The natural tendency is for everything to be brought, ultimately, to the same low level of random disorder. We call this the tendency toward increasing 'entropy.' It is the tendency for all material things eventually to reach a vanishingly low lever of available energy."

"What does this have to do with what we see outside?"

There was a murmur of agreement. That was what they wanted to know, too.

"Why, it has *everything* to do with it. The *only* reason that what we see out there surprises us is—*we're used to the disorder of nature.*"

There was a tense silence while they grappled with this explanation. Happily, this part was apparently true. Later on, things got more doubtful.

"What we're used to seeing in Nature is *disorder,* stars scattered around at random, different sizes and types of stars mingled together without any apparent plan. Throughout history, man has stood for order, and has had to fight against Nature's disorder."

"But now, men," I added, "at last we're in a place where Nature does things *our* way.

"So you see," I said, speaking fast into the intense silence, "some people may say, 'It can't be,' but we know better. Overall, it may be that the increase in entropy, the general decrease in available energy, is the rule. Overall, a tendency for random disorder may be the rule. But there is nevertheless a distinct small chance of exactly the opposite behavior. And the universe is a big place. Well, men, we've been lucky enough to hit it! Maybe we're just getting paid back for what we went through with those birds. Whatever the reason, when that cargo-control man got at the jump lever, we didn't land inside of a sun. Instead, we were lucky enough to come out in a place where *order is the rule.*"

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There was a confused murmuring, because naturally they failed to see the advantage of the thing.

"And to prove it," I said triumphantly, "take a handful of coins, and just toss them on the deck, and see what happens. In this place, *random chance produces order infallibly*. We *can't* lose. Try it."

Hook was listening, with the air of a connoisseur, and now shook his head exasperatedly. He couldn't quite follow the last part of that argument, and he didn't think the crew would follow it, either.

From all over the ship, however, there now came the sound of coins clattering on the deck. A rising murmur of amazement suggested the proper time to say triumphantly, "So, you see, men, there's nothing to worry about. The tendency of this place is to increase its own order by helping us get away. We'll be out of here as soon as we have time to check the jump equipment. Meanwhile, I suggest that all men not on duty experiment with this condition of reversed-entropy. It's a rare opportunity, and one that few crews have ever had before."

There was a brief cheer from some of the men. I snapped off the public-address system, and took a deep breath.

"Phew," said Hook, looking dazed, "Well, it looks like that will hold them for now, anyway."

"How long to check that jump equipment?"

"Not long. If nothing goes wrong, maybe half-an-hour. But then what?"

"Then we get out of here."

"*Another* random jump?"

"Can you think of anything worse than this? Or can you figure out how to calculate our way out of this?"

"No. But—"

"How long is our explanation going to hold the crew?"

Hook nodded. "We better get out of here before the novelty wears off."

"That's what I figure."

"But how do we know we won't wind up inside a sun? And how do we get back on course?"

"I could explain that to you," I said. "And it's a very logical explanation. The only thing is, Nature and logic don't always agree."

Hook, squinting, looked surprised for just an instant, as if he saw what I was driving at. "Yeah," he said, "Well, let's hope this is *one* place where they *do*."

Thirty-two minutes later, I reached out like somebody working a Ouija board, set up the jump, snapped the automatic reset forward to clear the board right after the jump, and pulled the lever.

What I'd been basing my hopes on, and it seemed like a pretty weak reed, was the thought that in this place we had order, not disorder. At least, it looked like *our* idea of order. And it was, you might say improbable almost, but not quite, to the point of impossibility. This

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was, in other words, a place where the next-to-impossible was established as the order of nature. In such a place, what would happen when we pulled the jump lever?

Anywhere else, the odds were astronomically against our getting back on course. But how was it here, where the order of nature was reversed?

This was one of those arguments that sounds good, but when you bet on it, you get flattened. Unfortunately, there was nothing else we could do *but* bet on it.

I don't doubt that other people have prayed harder than I did when I pulled that lever, but I was pretty near the top of my own form. Then there was that sense of a twitch, a sort of sudden readjustment that told of the jump, and then all of a sudden Hook, Pete, and Ace were banging me on the back.

"You *did* it, Al! You did it!"

"Did what? Are we back on course?"

"On course, my foot! Look at that screen!"

I wiped the sweat out of my eyes, and looked at it, then I shut my eyes and looked again.

Centered on the screen in front of us was a loading-center, where ships like ours pick up and transfer cargo. Near the loading center, a huge beacon sent out its visual identification signal, which you might still pick up even if radio, radar, snap-beams, and everything else failed you. As the big beacon swung around, there was a dazzling multiple flash that we couldn't help interpreting.

And when we did, it was an inescapable fact that the almost-impossible had happened. This loading center was our home base. The central office was right there in front of us.

Well, as you can imagine, Sam, the Old Man was really surprised to see us. He wanted the whole story, so I told him all about it—birds, cargo-control man, liquid food-drink, non-entropy region of space, and all.

Naturally, I expected skepticism, pointed questions, close examination of the evidence, and finally reluctant acceptance of the facts for what they were.

Instead, the Old Man started to laugh. He got back away from his desk in order to have room to double up, and almost laughed his head off. Then with his face still red, with a grin from ear to ear, what did he do but say, " 'Volcanic Bottled Food Drink,' eh? Is that the name of it?"

"No, sir." I could see this wasn't going to work out quite the way I expected. "Supernova Bottled Food Drink."

That sent him off again, and several times when I thought he'd come to the end, he'd bang his fist on the desk, and mutter "Supernova," or "Bottled Food Drink," and then he was off again.

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This can get sort of wearisome after a while, but he was the Boss, and it didn't bother him. Finally he came out around his desk, squeezed my hand in a painful grip, banged me on the back so hard I almost went out through the wall, and said, "Good work! That cargo went through on time, no complaints, and I heard how you put the squeeze on *Starbright*. That's the stuff! Keep it up!"

"But—Ah—But—What about the stars? What about—"

He let out a laugh that bounced all around the room. "You want to change your brand, boy. You want to keep away from that Volcano Bottled Food Drink."

When I went out of there, he was still laughing, and they tell me he'd start off again for no apparent reason for days afterward. Meanwhile, he didn't lose any time showing his approval of the fact that we'd got the cargo through. I hadn't gotten back to the ship before there was a crew out there painting out *Whizzeroo,* which was the name of the ship, and painting in *The Champ,* which was our new name. Personally, I liked *Whizzeroo* better, but we didn't have any time to croak about that. Orders came through confirming us all in the rank we had after the captain retired, so now I was a *real* captain, Hook was a *real* first officer, and so on, instead of our just holding the rank more or less by accident. Right after we got word of this, our back pay came through, and since this was partly based on our new rank, it fairly blew the tops of our heads off.

After you've borne up under bad luck long enough, when it does turn and run good for a while, it's easy to confuse the change with a permanent improvement. If we'd had much more praise and good luck, I don't think Hook and the rest of us could have stood it.

Just as we were settling back to admire all the new stripes, and as we were wondering what to do with all that accumulated pay, a message came through from the Old Man, who had gone off to tie up some deal, and wasn't expected back for a while. This message was to us, and it went as follows:

HUMAN RESOURCES RESEARCH CENTER ON ULTIMA WANTS TO EXPERIMENT WITH CARGO OF LIVE NATURAL FOOD FOR BANJO-BIRDS STP HAVE CONTACTED COLONISTS ON BIRDS HOME PLANET AND MADE ALL ARRANGEMENTS STP DETAILS FOLLOW STP I AM COUNTING ON THE CHAMP AND KNOW YOU WONT LET ME DOWN

It took a second to realize *The Champ* was the new name for our ship. Then the details started to come in. It seemed that these banjo-birds, in their natural state, lived on a diet of "web-scorpions," "flying slints," and "double-ended greevils." In turn, these things, in order to

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stay in good health, required a steady diet of a variety of *other* things, equally outlandish, all of which had to be housed in a "pseudo-arboreal habitat." The idea was not just to transport the greevils, slints, and so on, preferably frozen or canned, but to lug around the whole "pseudo-arboreal habitat," with all these things in it. Alive.

The contract, as expected, specified that the greevils, web-scorpions, et cetera, had to be certified by a cargo-control man before each subspace jump, but after what we'd lived through, that was no surprise. What did give us sort of a jolt was the provision reading:

". . . The aforesaid carrier does hereby warrant and agree that in no event will the food supply of the aforesaid units of live cargo be contaminated by permitting these aforesaid units of live cargo, voluntarily or involuntarily, to ingest human flesh, or extract from officers, crew, passengers, or others, blood and/or other nutrient materials whatever, in any quantity, manner, or under any condition or conditions whatever, foreseeable or not foreseeable . . ."

There are several other clauses in this contract along these same lines—namely, that we won't contaminate these specimens by letting them eat us up.

Well, Sam, it doesn't exactly sound *good*, and I don't know just what we'll run into, but I don't see how it could possibly be any worse than those birds.

Anyway, it isn't this new assignment that bothers us right now. What sort of burns us up is the reaction we get every time we try to explain about those stars. They don't call it a "mass-hallucination," which would be maddening enough. They call it, a "mass delirium tremens," and I never heard of anything like that.

I know, Sam, we should have kept some record of how to get back there, but then, a lot of people would have gone to look, wouldn't they? And that would have created *dis*order, right? And that, in other words, would have made our safe return a condition leading to increased entropy and *decreased* order, wouldn't it? But everything about that place showed that it favored *increased* order, not decreased order, so what do you suppose would have happened to us if we'd tried to keep a record of how to get back?

I tell you, Sam, there are a lot of people around today that you can't convince without a notarized statement, even when you've got a perfectly clear case, and unarguable good reasons such as I just mentioned.

Well, that's life.

Anyway, Sam, *you* believe me, don't you?

As ever,
Al

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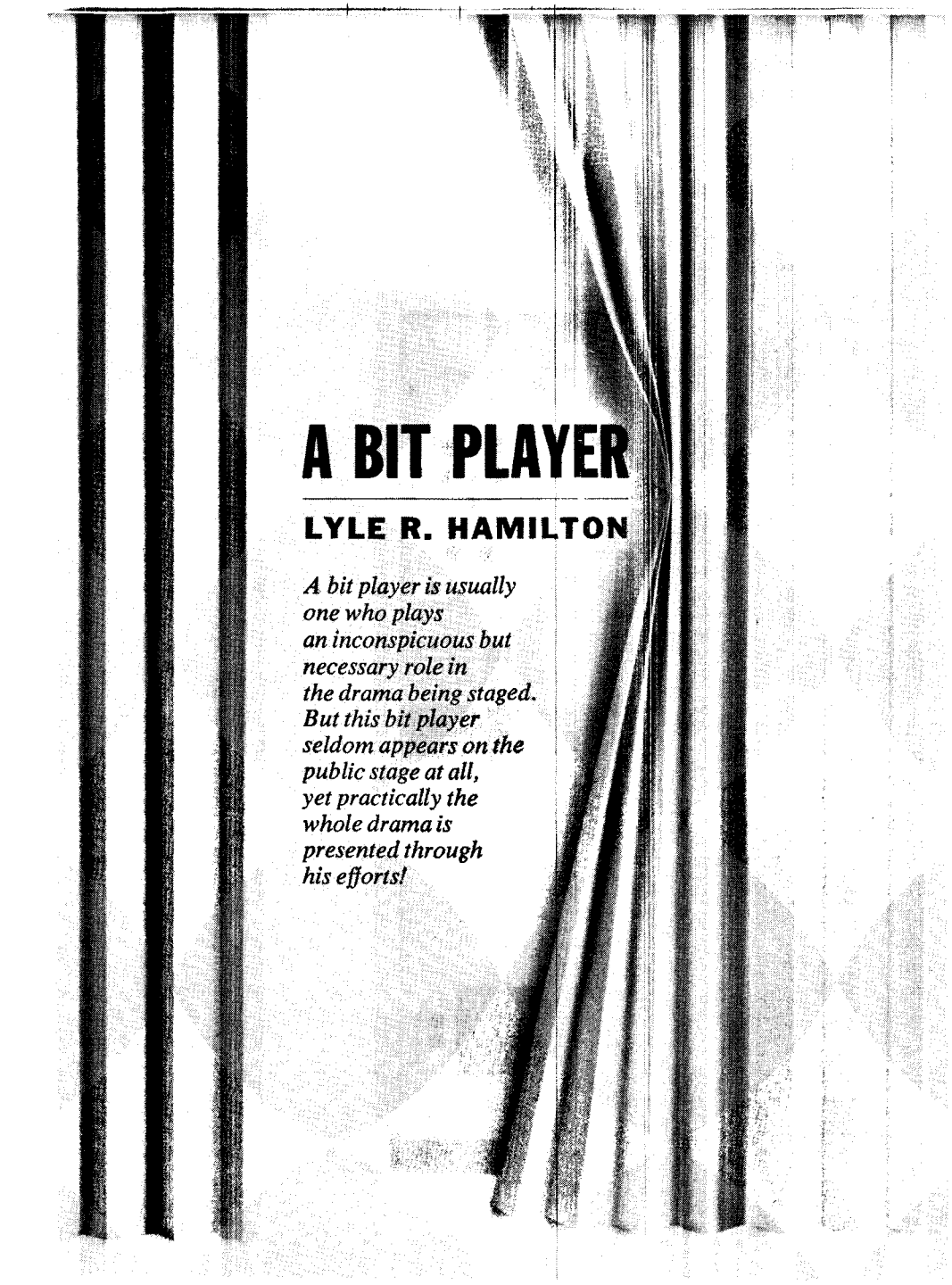

A BIT PLAYER

LYLE R. HAMILTON

A bit player is usually one who plays an inconspicuous but necessary role in the drama being staged. But this bit player seldom appears on the public stage at all, yet practically the whole drama is presented through his efforts!

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A BIT PLAYER

On board an Apollo spacecraft, in a translunar orbit, the Number Three Astronaut feels warm. "I'm hot," he innercoms to the Command Astronaut, "have my temperature checked."

The Command Astronaut keys his talk-switch for ground communication. They'd had a perfect mission so far and he didn't look forward to nauseated manpower. A fever could indicate almost anything. "Earth control, this is Command Astro. Have Aeromed check Astro Number Three's temperature."

"Roger, Command Astro," a voice replied. "Please stand by."

The Aeromed console looked just like the other pieces of ground electronics gear. A desklike metal box with three TV-like cathode-ray tubes read out an instantaneous quick-look of the Astronaut's health. This information was displayed in columns of figures on the tube's face. Behind the console, in an upright cabinet, the Astronaut's biological and medical measurements were permanently recorded by an oscillograph.

The oscillograph was a machine designed to store a five-hundred-foot roll of foot-wide graph paper. The paper transport mechanism pulled the paper between a row of special ink-pens and a metal plate, before re-rolling it on a drum. The operator, a qualified physician, glanced at the displays to evaluate the man's health.

The process, whereby this information is transferred, by radio, from the spacecraft to the ground and displayed in a fashion that a doctor can evaluate the Astronaut's health, is called telemetry. It's one of the many engineering sciences the rocket industry has adopted. Its home, among other places, is the oil fields.

Before World War II, in the midst of the depression, a revolution was taking place in our universities. Electrical Engineering, which studied methods of producing and distributing power, was gaining an offspring—electronics.

Electronics investigated ways to control and use electrons in motion. Radio was a common example. The budding electronic engineers—whose degree would probably be in Electrical Engineering with a communications option—was most likely a "ham," a radio amateur who'd rather work in his basement on his "rig," than play football on the street.

Power sources were unavailable, or too expensive, and that era's geniuses made batteries out of mason jars, metal strips and sulfuric

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acid. Unlike his modern counterpart, who, when his transistor radio gives out, runs to the corner drugstore and buys a new battery for a buck and a half. In those days the electronics man used his creative mind to *discover* markets for his wares instead of designing his product to meet the competition.

One application was in oil exploration. The wells were getting deeper and slanting off from perpendicular. Man was learning more about the underlying terrain. The engineers found that they could use electricity to measure the soil's acid content thereby estimating the location of oil-bearing sand. The process was fairly simple, they used a battery and a long pair of wires. The wires ended in a couple of probes while an ammeter was wired into the circuit near the battery. The probes scratched the well's inner surface and the current flow, as read on the meter, indicated the soil's nearness to black gold. This was plugged into a SWAG formula (Scientific Wild A —Guess) and since then SWAG formulas have dominated the electronics field.

It isn't that electronics isn't scientific; it's just that it tends to *defy* science. Mathematics, considered by many to be *the* tool for all science, falls short of ideal in practical electronics. This is because math, used properly, describes an occurrence. The engineer builds an electronic circuit and describes its operation in mathematical symbols.

The formula is assumed true for all, when it actually is true for only one. One reason is that parts used in the circuits may vary ten per cent or more. That's why television sets have so many adjustments. Naturally some of them are for the viewer's satisfaction, but the majority make up for sloppy tolerances and set aging.

This vagueness creates a problem for the hardheaded mathematician. Consider a surveyor, wouldn't he be frustrated if each mile varied between 4,752 and 5,808 feet? Or the small car owner? This would make his gas mileage darned irregular. What could he brag about?

Circuit designers must fall into two categories, the theoretical mathematician and the decade box manipulator. The mathematicians comprise about ten per cent of the ranks. To design a circuit they spend weeks exercising—driving out evil spirits—a slide rule, recalculating and burning incense to Frederick A. Terman (dean of Electrical Engineering, Stanford University, considered by many to be the Father of modern electronics). Even the wise and experienced mathematicians learn when to throw in a fudge factor to make up for part variations. (An application of SWAG.)

The decade box—from which the remaining ninety per cent take their name—is a small container

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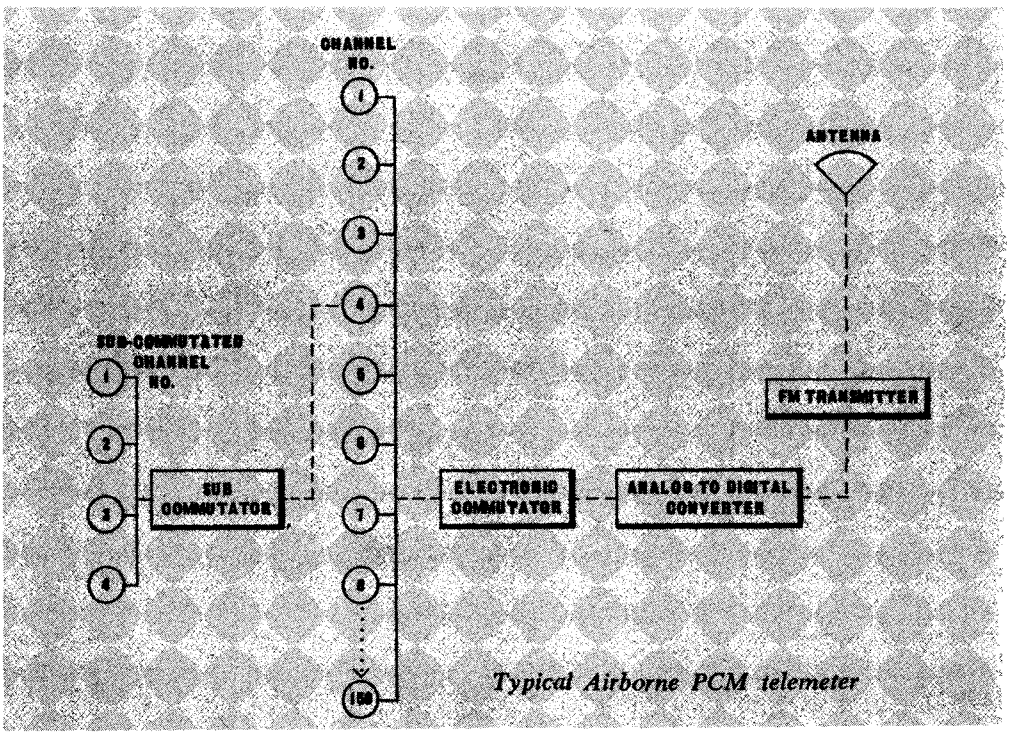
filled with resistive or capacitive values and a rotary switch. It can be jumpered into a circuit in seconds and its values switched in one at a time. Designers in this category are usually ones who've tried mathematics and given up in disgust. (But I've worked with one man who was degreed in mathematics and working as an engineer —he used a decade box.) They've reduced circuit creation to the art of rotating the selector switch until the circuit plays as required. Then they substitute a manufactured part of the same value selected on the decade box.

In time competition, these two approaches tie. Neither one gaining over the other, but each is amazed at the unexplained success of his associate.

Before the '30s, oil and water wells were drilled about the same. The drilling expert was an unshaven, whiskey-breathed man in a pair of bib overalls—not a college grad in a tailor-made suit. If the driller wanted to know what was going on down below, he'd pull up the drill bit and catch the sun in a mirror. He'd hold the mirror at an angle to



Typical Airborne PCM telemeter

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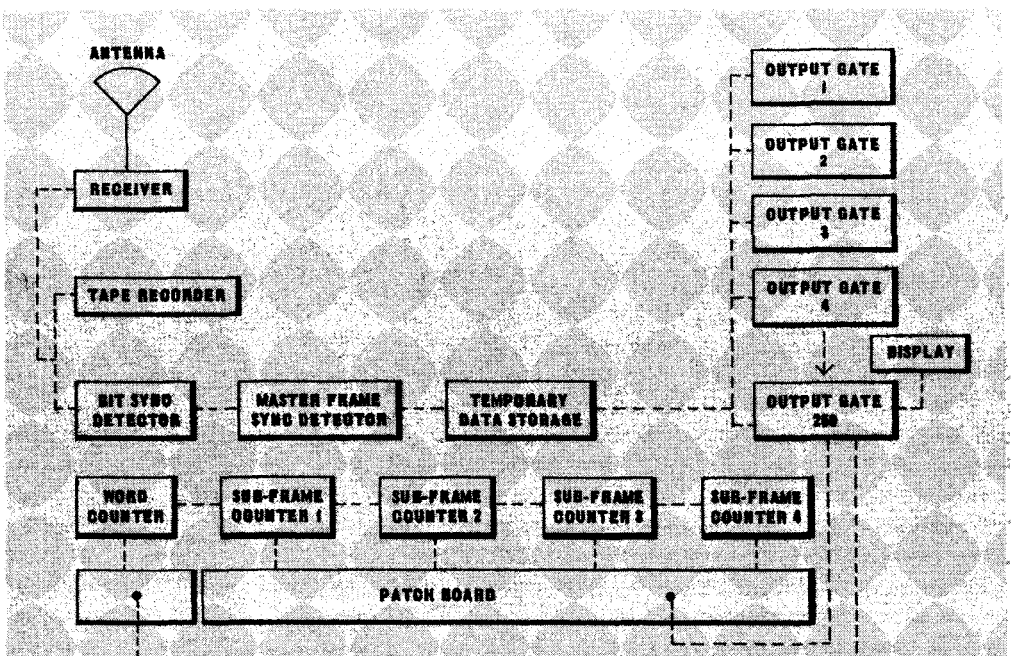
reflect the sun's light down into the hole. It was a crude method, but it did the job—for a while.

Technique advances brought the engineer into the oil field. One of the firms in oil exploration was Schlumberger International. (It's a French name, not ground up Schlum.) Exploration as practiced by Schlumberger was a different approach to free enterprise. They owned every piece of equipment imaginable and leased it out, as required, to the wildcatter or to the big company. You hired what you needed, from an engineer to an entire rig.

The college engineer was a world apart from the on-site wildcatter. Schlumberger sought to bridge this gap by establishing one-man one-cigar diplomacy. The engineer, when first arriving on the site, was directed to give each man a cigar *before* talking business.

High-speed deep-hole drilling is a complicated procedure. The bit is cooled by water which is pumped down around it and back out into a settling pond. The pond lies below and to one side of the drilling rig.



Typical PCM ground station

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Here the heavy solids fall to the bottom and the murky water is pumped back down into the well.

The drillers tell of an incident involving a man fresh from school, dressed in a new suit. He drove up in a brand-new company car and walked up to the rig. "What's your trouble?" he asked.

The head driller gave him a dirty look. "Where're our cee-gars?"

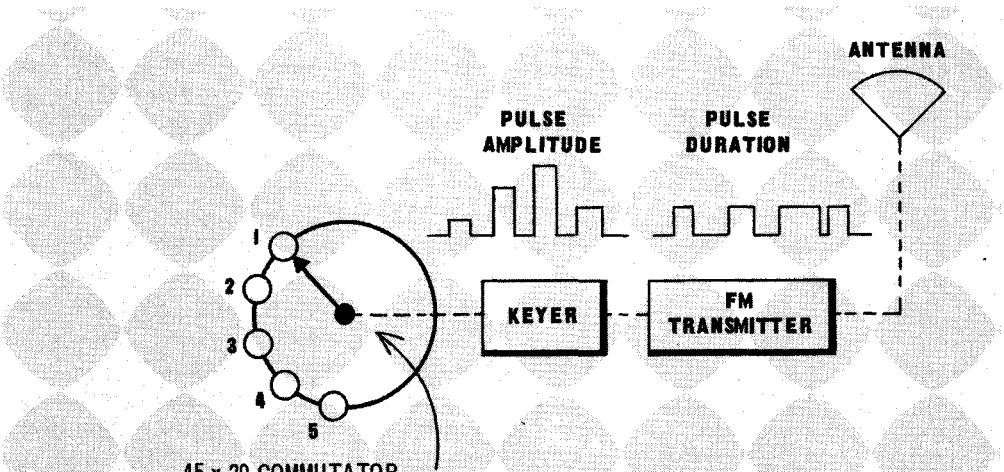
The young man was puzzled; he'd slept through an important company lecture and expected to get down to business and then pass out the cigars. "You'll get your cigars, soon as I find out your problem."

"Boy," said the driller, "yew better get them cee-gars now—or I'll toss yew into the sump."

"You wouldn't do that."

Right then, the drillers claim, the man went sailing over the edge, new suit, education and a wish that he'd brought the cigars with him instead of leaving them in the car.

At the start of World War II, Schlumberger put their electronics men to work, forming Electro Mechanical Research, to find electronic answers to wartime prob-



Typical PDM/FM telemeter

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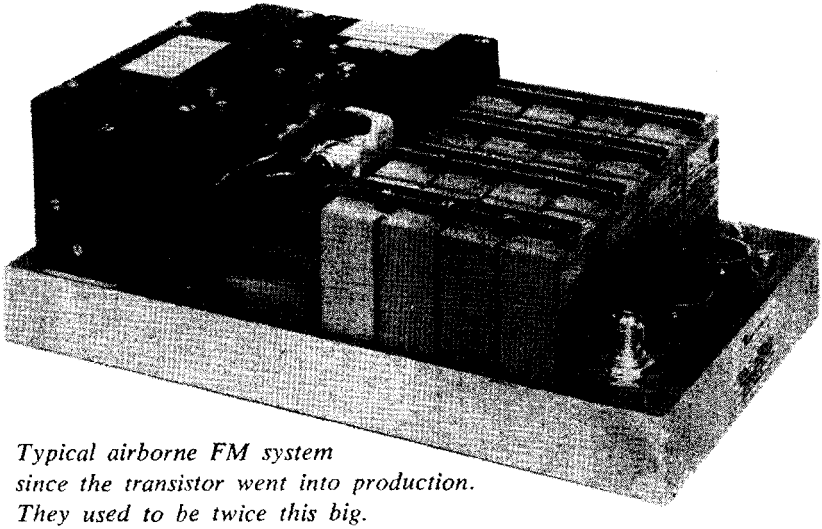

Typical airborne FM system since the transistor went into production. They used to be twice this big.

Courtesy Bendix

lems. They developed a device that mounted onto a jeep. The jeep scurried about in front of a truck convoy and when it came near a land mine, the electronics disengaged the clutch. It was sort of an electro-mechanical setter, except that it wouldn't work on pheasant, grouse or quail.

In 1940, the aircraft industry picked up the oil men's technique. Airplanes were flying faster than ever before. There were some things happening that didn't make sense. The designers were afraid that their low speed formulas weren't working at high speed. They needed something to give them more information about dynamic flight.

Someone at the project level went to Consolidated Electrodynamics Corporation for help. CEC was a wholly owned subsidiary of Herbert Hoover, Jr.'s United Geophysical Co., an oil exploration firm. CEC provided acoustical transducers—tiny microphones—and photographic recorders.

Methods of recording the fluctuations of electron flow have varied. The most simple is a man watching a meter and writing what he observes on a paper pad. If the electron flow is irregular or periodic and the engineer is particularly interested in those changes, he might use an oscilloscope.

The oscilloscope is a lot like a TV set. In fact, one can jury rig a TV set with a good oscilloscope and two telemetry receivers, one

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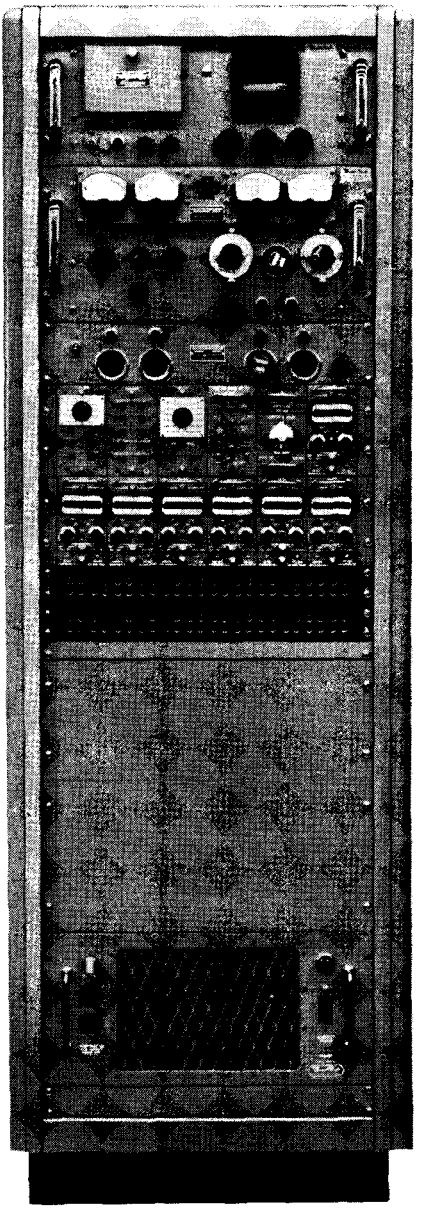

Courtesy Bendix

each for audio and video. The oscilloscope's internal electronics sweep a dot of light across the screen. If the dot sweeps fast, it appears as a line.

The operator connects what he wants to monitor to the vertical input. The electronic variations act upon an electrostatic field which moves the sweeping dot up or down. The oscilloscope is an excellent laboratory tool for seeing inside an electronic circuit. It only has one drawback—it doesn't make a permanent record.

Oscillographs, which do make permanent records, fall into two categories, photographic and ink pen. For decades the photo recorder has been favored. The competitive ink-pen models got clogged up and would unclog themselves, spewing ink all over the place. (Making a white-collar worker into a blue-spotted one.) In addition they were nonlinear. The moving arm pivoted about a point and drew arcs for straight lines. They compensated for this by using curved-line graph paper.

The last five years have seen improvements in ink-pen recording. They've developed recti-linear pens which draw straight lines and aerosol canned ink. (While they're not as messy as they once were the ink is *harder* to remove.) Ink recordings are making a comeback.

CEC, founded in 1937, has been the major contributor to photo recording techniques. Light-sensitive

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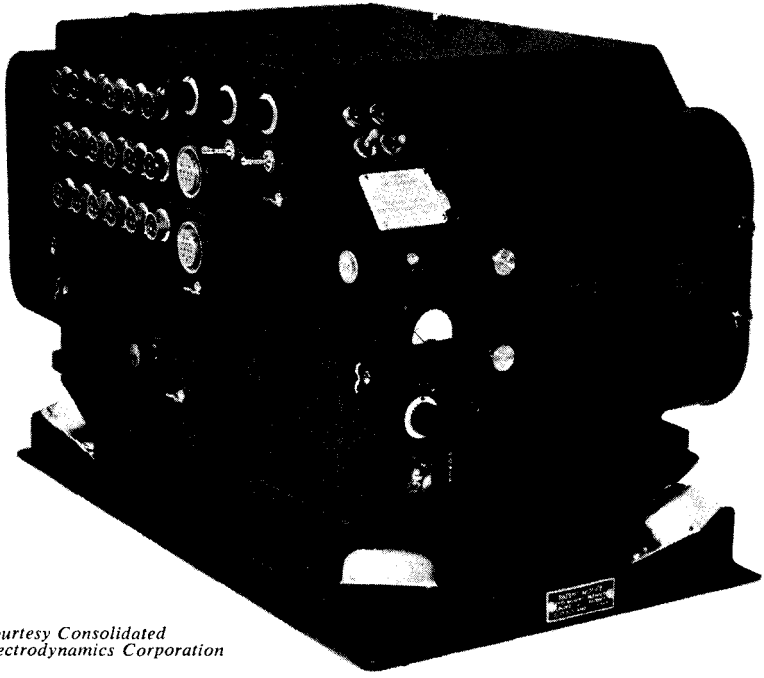
paper is loaded into a magazine and flows in front of a small opening. Pin points of light, reflected from mirrors mounted on d'Arsonval movements, called galvanometers, inscribe their changing position onto the paper.

Until 1958, the paper was removed in a darkroom and developed by a processing machine. The trend now is to use a light-developing technique, something like backwards photography where exposure to room light brings out the image. This method supplies records quicker.

The aircraft people adopted many standard radio parts for use as telltales. Many terms are used to denote the pick-off device—*transducer* and *end instrument* are only two. A simple volume control, known in the industry as a potentiometer, is an ordinary resistor, a coil of wire or strip of carbon that impedes the electrical flow. A slider has been added, which moves the

(opposite) Late model FM ground station without readouts or recorders.

In production since 1948 the CEC model 5-114 oscillograph was used to record the flights of all the old ones: Atlas, Thor, the works.



Courtesy Consolidated Electrodynamics Corporation

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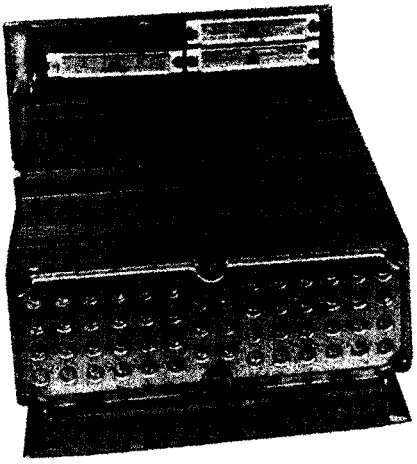

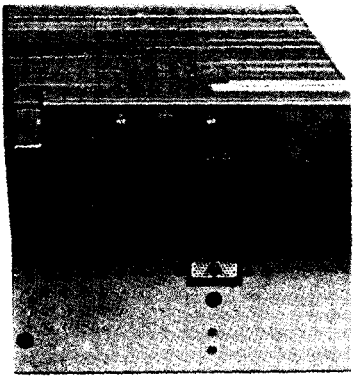

length of the resistor. A voltage is dropped across the resistor and the slider's position picks off a voltage proportionate to its position.

They fastened this potentiometer onto the pivot point of a rudder, elevator or other movable control surface. The voltage at the pick-off point was analogate to the control surface's position. Tiny microphones installed throughout the aircraft measured the amount of noise and vibration at those points. Twist and strain detection used another resistor type. It was called a strain gauge and was built by weaving a line of resistance wire back and forth in a single plane. This was imbedded in a thin plastic shell. Twisting the shell disturbed the wire's position, changing their resistance.

Each voltage change created by these transducers was used to drive a different channel on the airborne oscillograph. Thus, wired for sound, the experimental aircraft took off for a test flight. The oscillograph recorded all the structural motion and strain.

When the flight was over, they jerked out the magazine and rushed it into processing. That night there were some long faces in the corner tavern. The test was a failure.

Those traces crossed each other, tied themselves into knots and even skipped completely off the paper. The problem was that the different parameters put out too wide a variety of voltages. It would be necessary to whip these variations into control. They went back into

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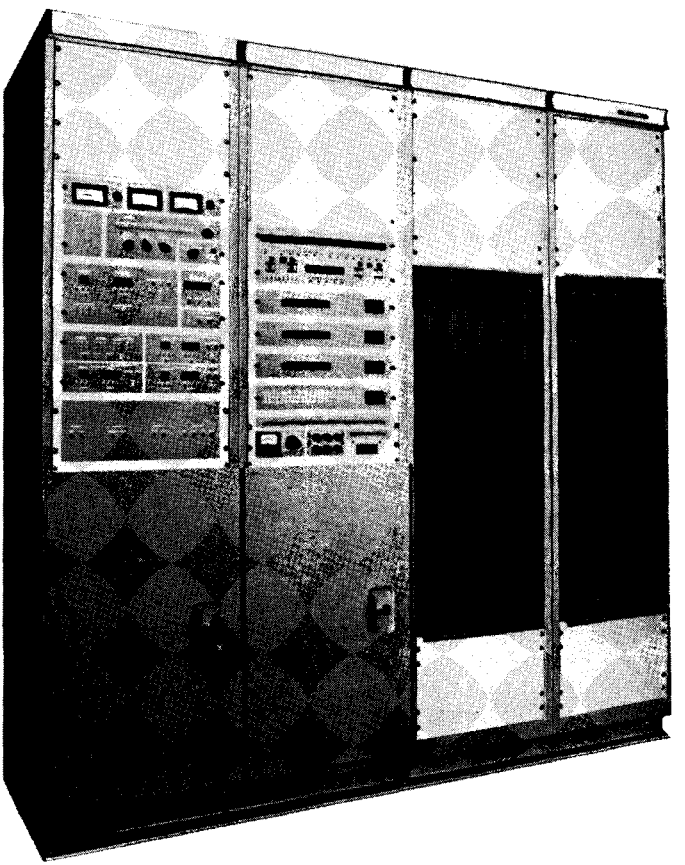
(opposite) Apollo Spacecraft PCM Telemetry System

Radiation Incorporated's Automatic PCM Decommutation System features magnetic core memory programming—accepting up to eight discrete decommutation programs. It is programable from punched tape, computer, or manual control panel. The system incorporates Radiation's unique digital logic modules.



Radiation Inc.

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the lab and came up with a plan to attenuate the strong measurements and to amplify the small ones—to standardize them all into a conditioned signal. Today's measurements are conditioned to a "high level" standard, 0 ± 2.5 or 0 — 5 volts and a "low level" 0 — 200 millivolts, (0.2) or 0 — 40 millivolts (0.04).

Signal standardization created the ground work for a vast new realm of personal conflict. Conflict which wouldn't be solved with satisfaction until project Apollo.

The structural people understood shaft rotation, vibration and stress, but they didn't understand squiggles on a long paper strip. Furthermore, they refused to try. To a degree this conflict grew out of departmentalization. Even today system development is divided into specialized groups. Like all groups these people develop a team spirit which ends up with each group at technical loggerheads. Project management's main function is to integrate the divergent thoughts into a company team instead of competing structural, power plant and armaments teams.

Telemetry, because of its interface, has had to become familiar with everyone's system and learn to talk their language. This diplomacy has fallen on the shoulders of data analysis. The analysts have the routine job of taking the flight data and reconverting it into engineering equivalents. This is done by running a pre-flight calibration on all measurements and plotting the calibration points onto a graph. The graph accurately translates the conditioned signal back into degrees, inches of displacement and stress units.

Data analysis requires people with tact approaching infinity. It's their job to show the structures people that they're underdesigned and the power-plant experts that their pet engine vibrates badly.

I recall one missile—it's obsolete now—that wore a pair of ramjet engines and flew nearly five hundred miles an hour. One day, a minute after launch, this bird went into a left spiral, wouldn't pull out and was destroyed.

Data analysis indicated that the left engine dropped to 10% power and that the fuel flow was 10% as well. Because fuel flow regulates engine power, just as your car's accelerator does, it was safe to assume that either the fuel line sprung a leak or that the line's pump had just rolled boxcars. Further data review showed that the rudder was set to recover from the spiral.

Despite this evidence we couldn't convince the power-plant people that their left engine had gone fizzle. As far as they were concerned it was a normal flight and would have remained so if the Safety Officer hadn't accidentally hit the Destruct button. One man had guts enough to complain that the telemetry system was bad and the

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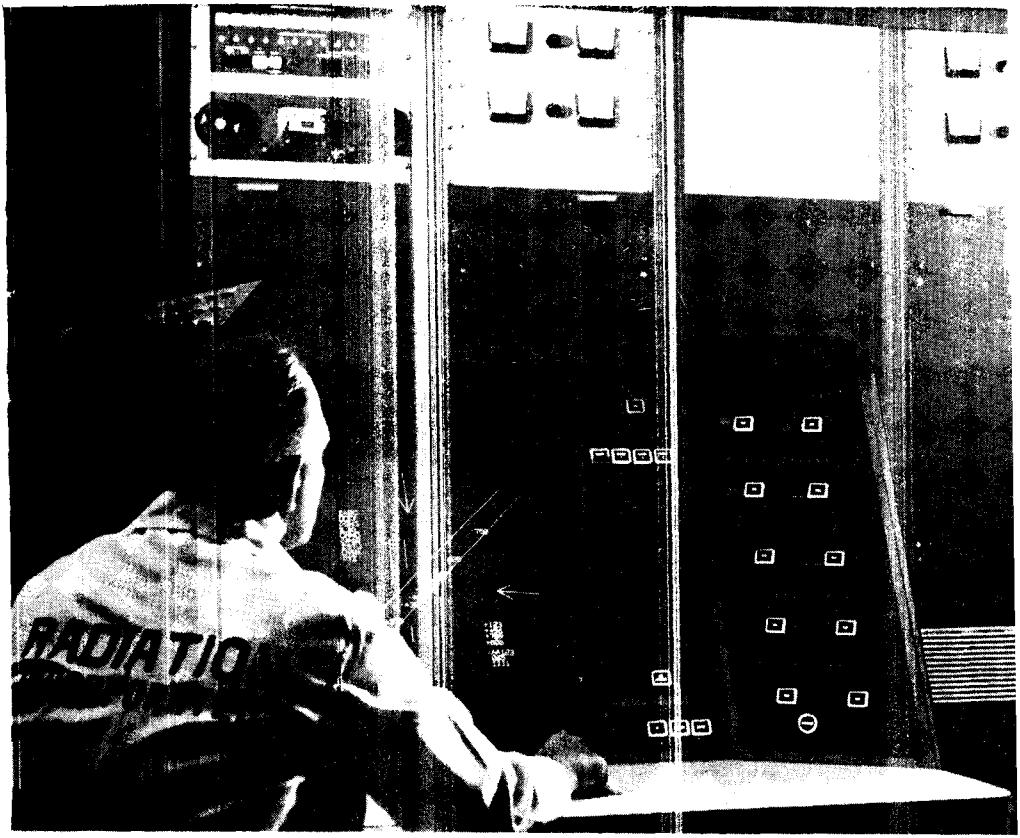

Radiation Inc.

Radiation Incorporated Alpha Numeric Simulation Display System Console with Central Buffer.

cause of the information which showed the problem.

1946 was an exciting year for the American rocket industry. The vivid demonstration of missile weaponry was fresh in our memory. The Army had an arsenal of captured rockets and a handful of German ex-patriots. The Navy had the memory of Dr. Robert H. Goddard and the Air Force was making plans for the mighty Atlas missile.

The Navy, least heralded of these, had their own design. It was called the Bumblebee. From it came the Talos, Terrier and Tartar missiles. But more important—reliable radio telemetry.

Bumblebee's technical details were charged to Princeton University and Johns Hopkins University's Applied Physics Laboratory. Bendix-Pacific was made prime contractor for the guidance system. FM/FM telemetry and Bendix's

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U.S. Air Force

Telemetry receiving antennas improve, too. Compare this 2½ turn helix (circa 1954) with the TLM 18.

major role in the FM/FM technique evolved from their desire to check the guidance system's operation.

The men at APL chose FM for their basic transmitter because it was quieter than amplitude modulation, AM. Radio noise rides on top of a radio wave. In FM the wave's top can be sliced off without destroying the information being transmitted. FM/FM was a unique twist. They used FM oscillators with center frequencies between 400 cycles and 70 KC. These oscillators were called SCO's (Subcarrier Oscillators). Years later industry changed the name to VCO (Voltage Controlled Oscillator). This change in name didn't affect the circuit itself. The oscillator outputs were mixed together and used to drive an FM transmitter in the 200—250 megacyle range.

On the ground an FM receiver was tuned to the transmitter's frequency. Its output, the mixture of all the SCOs, was put onto a coaxial buss. The buss fed a bank of discriminators. Each discriminator was tuned to a different SCO frequency. The voltage output of the discriminator drove an oscillograph.

Several missile systems flew FM/FM. Among them were Bumblebee, Atlas and Bomarc A. Even though it's an old concept it has found use in quite modern systems, the Mercury capsule and even more recently Gemini's I and II. The drawback to FM/FM is the limited number of channels which can be transmitted. It's possible to measure eighteen parameters with one transmitter and naturally eighteen more with each additional RF link. It wouldn't take long, at this rate, to overload a rocket with just telemetry. Something had to be done to improve the technique's capacity. This led the TM engineers at

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ASCOP, Applied Science Corporation of Princeton, to bone up on Information Theory.

Information Theory has joint origin. Norbert Wiener, an MIT mathematician, was the first to recognize that communicating information is a simple statistics' problem. He stated this theory in a classified World War II document dealing with antiaircraft warfare. In 1948 he followed this up with his now famous book, "Cybernetics, or Control and Communication in the Animal and the Machine." In the same year, Claude Shannon of Bell Telephone Laboratories published his work, "A Mathematical Theory of Communication."

The books, aimed specifically at the electronic engineer, have a fascinating aspect. They insist on thrusting the engineer beyond the confines of his profession. To say, "Wake up buddy, your world goes beyond this walled-in lab. Like it or not, you're part of the whole." One of Cybernetics' most important lessons is "any organism is held together by the possession of means for the acquisition, use, retention and transmission of information." Hence, information theory has potential use in a dozen or more fields, from psychiatry to sociology. In psychology, neurophysiology and linguistics the theory has already been applied with considerable success.

Now, for the first time, man has a unit of measure for the amount of information contained in various message classes—even though the classes may be as varied as the voice on the telephone, a TV picture or the language of Shakespeare. When the engineer has used the theory to measure the amount of information, or information density, he can then tell how large and efficient his transmission channel must be to carry each message.

A particular problem is, that, even though the term information is very carefully defined, information theorists have considerable trouble getting people to stick to the definition. This may be because the people really haven't understood the definition. To the engineer, information is contained in any message he is asked to transmit. He isn't interested in semantics or meaning; he must assume that even gibberish may have meaning if someone is willing to pay its transmission cost. Indeed, good *random* gibberish will always contain more information than an equally long sentence of sensible English.

To demonstrate, consider yourself watching a weekday soap opera. Typically the story has drug on for years about the doctor's new wife and her love affair with a local beatnik. This scene is broken into by an upside down *important news message* card and then your favorite newscaster's face flashes onto the screen. "Shot," he jabbers, "drivin' long . . . bam bam . . . dead now . . . foreign minister . . . he's

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shot . . . liquidated."

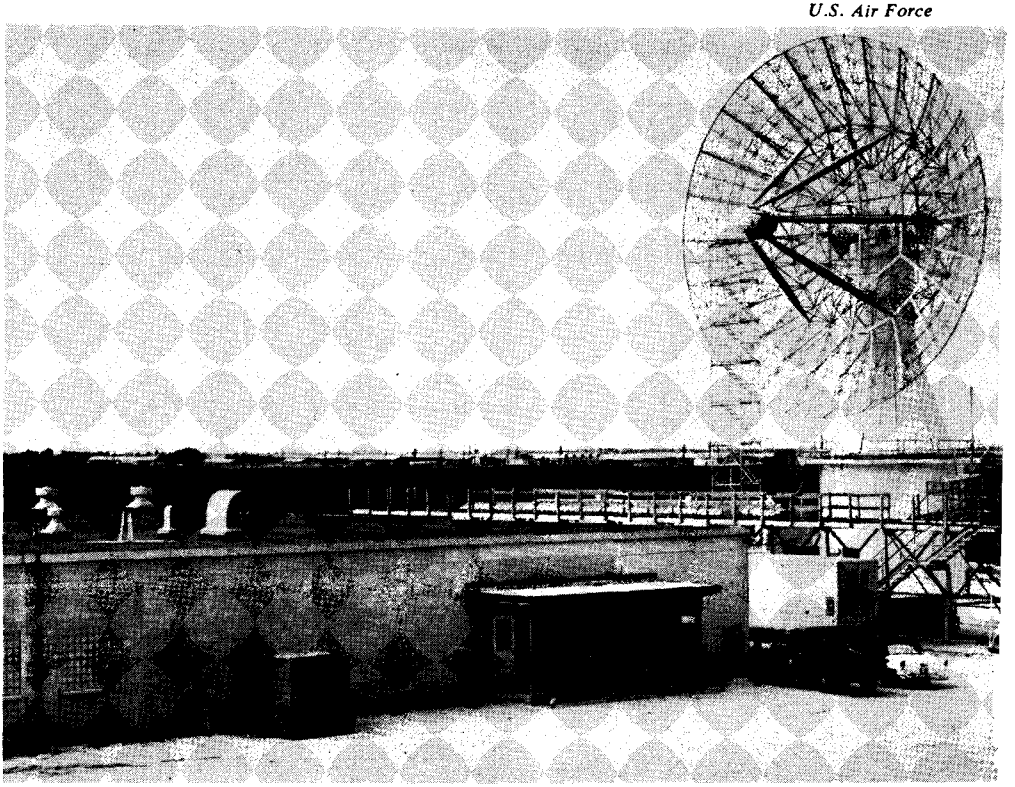
Then the scene returns to normal telecasting. While the newsman's remarks weren't total gibberish they were near enough to get the man chewed out by his superior. The point is, the viewer received more information from the newscaster's twenty-second interruption than he'd get from a year's viewing of the regular program.

The men at ASCOP gave FM/FM a very critical look. They determined that the method was really loafing and they could transmit much more information with a minor change.

The basic problem indicated by Information Theory analysis was that many parameters were generally static. Battery voltages, switch closures and the like didn't change.

This baby doll antenna (TLM 18) makes orbiting Gemini's 2½ watt transmitter seem next door. The building is Project Mercury's Mission Control.

U.S. Air Force



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They had very low information density.

The ASCOP engineers ran these parameters into a rotary switch called a commutator. The commutator's output, a series of pulses whose height equaled the parameter's conditioned value, drove a circuit called a keyer. The keyer changed the varying amplitudes into varying pulse widths and drove the 70 KC SCO. The system was named Pulse Duration Modulation. It found use on the Bomarc B, the Polaris and the Saturn I.

PDM represented a last minute stop-gap approach. The demand for total flight information continued growing and forced this nation's TM engineers into a tight corner. One thing loomed from the cybernetics texts like a tall pine in the Florida flatlands: "The English language may be reduced to a combination of only two symbols." Just like the Morse code consists of two symbols, the dot and the dash.

"Where," they asked themselves, "are we going to find a TM technique that will work with only two symbols?" The ASCOP engineers turned to digital computer technology. Perhaps the answer was there. They knew they could drive an Analog to Digital converter with an ordinary commutator. The rest of the system would take years of research.

Digital computers make use of a number system to the base 2. That is, it uses two symbols, 0 and 1. Our conventional decimal system is to the base 10 which means it uses ten separate and distinct symbols, 1 through 9 and 0.

To count in binary we start at zero and go upward, 0, 1, 10, 11, 100, 101, 110, 111. Large numbers converted to binary grow at a phenominal rate, for instance, 255, is 11111111. This system is simple and therefore confusing for man to use. But a simple machine, in which 1 represents the closure of an electronic switch and 0 is the opening of the same switch, can make rapid and accurate calculations in binary.

In the span of a decade, two things of industrial importance occurred. In 1950, Homer Denius and George Shaw, top-level engineers from Melpar, a division of Westinghouse Air Brake, formed Radiation Incorporated. It was a small research firm operating out of a Melbourne, Florida, aircraft hangar. The company had that vital spark, it grew. Radiation set out to capture part of the PCM market. ASCOP and Radiation were in direct competition.

In 1958, Schlumberger, our old oil friend, bought out ASCOP, who had nearly perfected their technique and gave it to EMR. EMR had made a name for itself in the post-war period. They built one of the most rugged FM discriminators on the market. ACSOP's TM engineers were moved to EMR's Sarasota, Florida, plant.

The problem faced by the com-

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petitors was to build an entire TM system around one or more Analog to Digital converters and to reverse the process on the ground.

The Analog to Digital converter consists of three major parts, a hold circuit, a comparator and a reference. The reference unit contains a voltage equal to the maximum level of the conditioned signal. This is tapped at eight different points. The first is 50%, the second 25% and the third 12½%. Each increment being half of the next higher. A pulse from the commutator enters the holding circuit. The comparator looks at the pulse and the 50% voltage. If the pulse is greater, the comparator transmits a binary one; if it is less, a binary 0. In two or three microseconds the comparator juggles the reference voltage taps to equal the measurement and has transmitted an 8 bit binary word equivalent. The next pulse now enters the hold circuit and the process repeats.

The object of airborne system design is to create a unit which will transmit messages with varying information density at maximum efficiency. To build around we have commutators and an Analog to Digital converter which will make an 8 bit word from either "high" or "low" level pulses.

First let's toss in a main frame communtator. Arbitrarily, it will accept one hundred fifty information channels. But this throws a very small wrench into the gear work. Each channel now has equal information capacity. Assume that a measurement, call it *bulkhead vibration,* has a density twice that of a data channel, how can we transmit this information? If we wire two equally spaced channels together, say 1 and 75, 2 and 76, or 3 and 77, each channel now provides half the density requirement. This approach, called super-commutation, allows us to multiply a single channel's information capacity.

Measurements, whose information density is much less than a main frame channel, receive an opposite treatment known as sub-commutation. We can take four measurements whose density is one fourth that of a main frame channel and put them into a four-input commutator running at one fourth the main commutator's speed. We wire the commutator's output onto a single channel in the main frame commutator. On the main frame's first rotation it will transmit the first sub-commutated word. On its second rotation sub-commutated word two is transmitted in the same time slot. On the fifth rotation of the main frame commutator the first word is repeated.

We can select several sub-commutation rates to fit the rocket system's data needs. In this manner the airborne transmitter puts out a coded waveform which might be compared to a written paragraph—each word containing eight letters

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or bits and each sentence being one hundred fifty words. The term Master Frame is used to describe the data transmitted in the time required to make every measurement one time. If our slowest sub-commutation is at a 96 to 1 ratio the master frame would be ninety-six sentences, sub-frames, long.

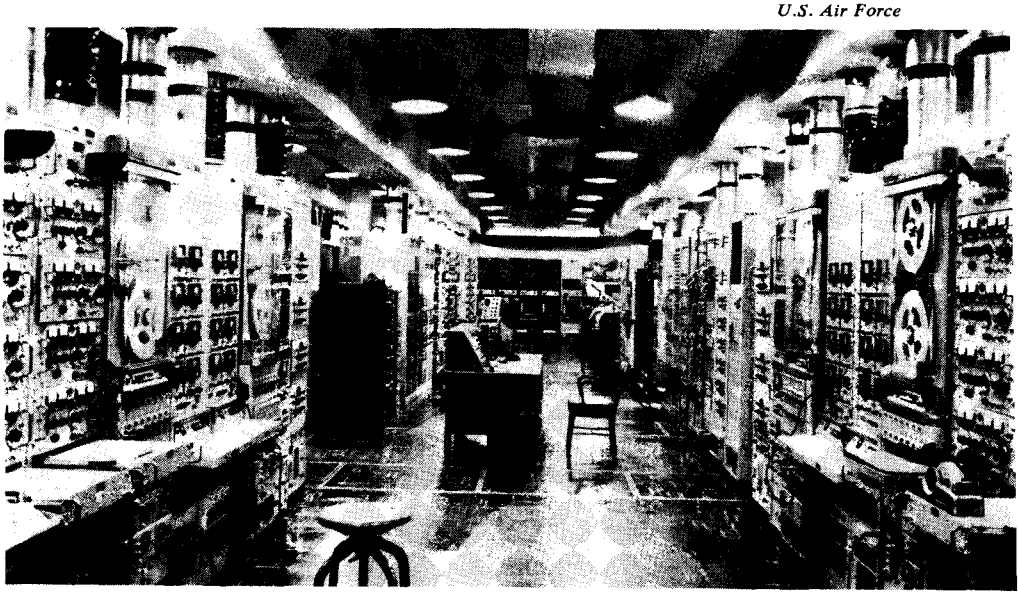
To receive this data our ground system must find a particular word and sub-frame and move this data word to a recorder, or display, where it can be used. Timing is now very important. We know that the incoming signal is in specific order. We must synchronize the ground station with this order or our data output will be nothing but garbage.

The first synchronization takes place at the bit rate. This set up the ground station to the transmitted signal's rate, 51,200 bits per second on Gemini and Apollo. Then the system seeks master frame sync.

A unique master frame sync word is programmed into one of the sub-frames, usually words 1, 2, and 3. It repeats itself once every master frame so the word slots may be used for data during the rest of the format. In the receiving station this same code is programmed into the master frame sync circuit. While the data flows by, bit by bit, the frame sync circuitry looks for this

An FM/FM ground station was a huge array from the receivers and recorders (foreground) to the oscillographs (far in the rear).

U.S. Air Force



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unique combination. The instant the sync word, or a word combination identical to the sync word is spotted, a counter, set to count at the master frame rate, begins counting. This blocks the frame sync search temporarily. When the counter reaches the time required to transmit one master frame it resets itself to one and commands the master frame sync circuitry to look again. It's possible that data could have three consecutive words identical to the unique sync word. But it's believed that the data would change by at least one bit during a master frame. The frame sync circuitry looks again and, if it sees the unique combination, it assumes it to be truly the unique word and not data. The system now goes into master frame "lock." Each master frame, the circuitry looks again for the unique word, to determine that it's still in sync. If the word is missed at any time, the system goes back into a search mode until the unique word is found.

Entrance into master frame sync clears the system to acquire sub-frame sync. This is done in the same way but with a different unique word.

Pulling data from the transmitted format and routing it to a recorder or other display uses internal station timing and gating. The data comes in a word at a time, like cows into an inoculation pen, and every one or two microseconds it's replaced. The system must be able to handle main frame, super-commutated and sub-commutated data.

The ground station uses a word counter, which counts the number of words in a sub-frame and several sub-frame counters to keep track of the sub-commutation ratios. The counters route signals for each time slot to a patch board. At the patch board the station operator may select any time slot and patch it to an output gate.

Clever output gate design makes this approach work. The gate has a data input and two coincident trigger inputs. If the trigger inputs are not patched into the timing circuit, the gate remains open and will pass every data word.

Connecting one of the trigger inputs to a word time slot shuts off the gate except when the counter makes a count at that particular point. Assume that we've patched word 25 to output gate 12. Every sub-frame the gate opens at word 25. If we patch a sub-frame into the other trigger input, the gate opens only when the word and sub-frame are coincident.

Because super-commutated data occurs each sub-frame we need to patch in words only. But, we must open for more than one word to get all the data. Here we use a strapping gate. It has several word inputs and a single output. We patch all of the word times to the strapping gate and patch the strapping gate's output to the output

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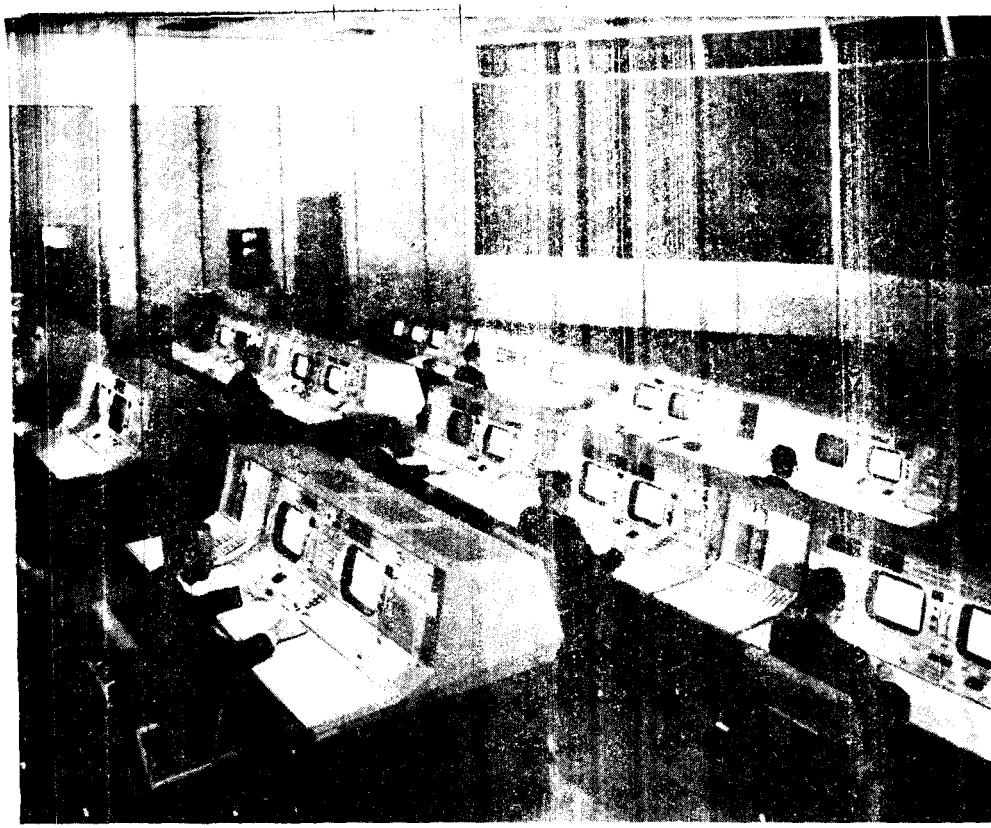

NASA

Interior view of the Mission Control Center—where the Bit Player dances on the electronic stage.

gate. This opens the output gate on each selected word.

Radiation nosed out EMR in developing the first complete system, winning awards for the last of the Titan I's and Minuteman. EMR's system was working in time for the ill-fated Dyna-Soar and most successful Gemini systems.

Telemetry utilization, as a flight check-out tool, continually grows. In the FM/FM and PDM days they made a magnetic tape while the data was being put onto the oscillographs. (It's really debatable if these older techniques will cease being used. Spare components from old systems always find their way into solving new engineering problems.) The home plant got the tape for further study and the on-site engineer was left with the oscillographic records. Even if trouble occurred, it couldn't be researched until the recordings were out of the processing tank. This meant a de-

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lay of an hour or more. Even the new daylight recording paper took time to unload and unreel.

PCM produced more valuable data than there were people to evaluate it. So real time information was recorded on magnetic tape and played into a quick-look station at the same time. System engineers selected a few critical measurements for viewing on non-recording displays.

Another area played the tapes back, selecting critical times and related parameters, putting this information onto oscillographs for critical examination. The magnetic tape was played back through a computer for a total data dump.

Gemini has brought a slight change to this procedure. Instead of using a quick-look station, selected parameters are gated to the different equipment consoles. The console operator sees his parameters displayed on a meter. The tapes are retained for on-site evaluation.

The Apollo system goes one step further. Between the output gate and the data display is a computer. Before a test, engineers dump parameter calibration curves into the calculator. When the Apollo is turned on the computer compares its memory with the real time information from the PCM ground station, then displays several items on the equipment console's TV tubes. The operator sees the parameter name, its binary measurement and the engineering equivalent. The tactful data analyst isn't required for interpretation.

There's a trend toward making PCM equipment compatible with future requirements. We might as well, the technique will be with us for years. Let's compare Radiation's Apollo and LEM airborne systems with their model 540 universal ground station.

Apollo transmits 270, 0-5 volt measurements and 50, 0-40 millivolt channels. LEM transmits 386 high-level channels and 55 low-level ones. Both use a 51,200 bits per second bit rate.

The 540 ground station will sync to a bit rate from one to a million bits per second. Its frame sync circuitry will accept a unique word from 7 to 64 bits long and can be wired for a 64 bit data word. The system has the capacity to decommutate 512 channels at four different sub-commutation ratios and a core memory unit replaces the patch board. (Believe me, that's a blessing.)

At Earth control the Aeromed operator shook his head. "Astro Number Three's temperature's normal." He raised his voice now, so that all could hear. "Anyone have an idea why our Number Three man should be overheated?"

Another man, at another console, in charge of the Environmental Control System glanced at his displays. "Yeah," he said. "He's got his suit temperature turned up." ■

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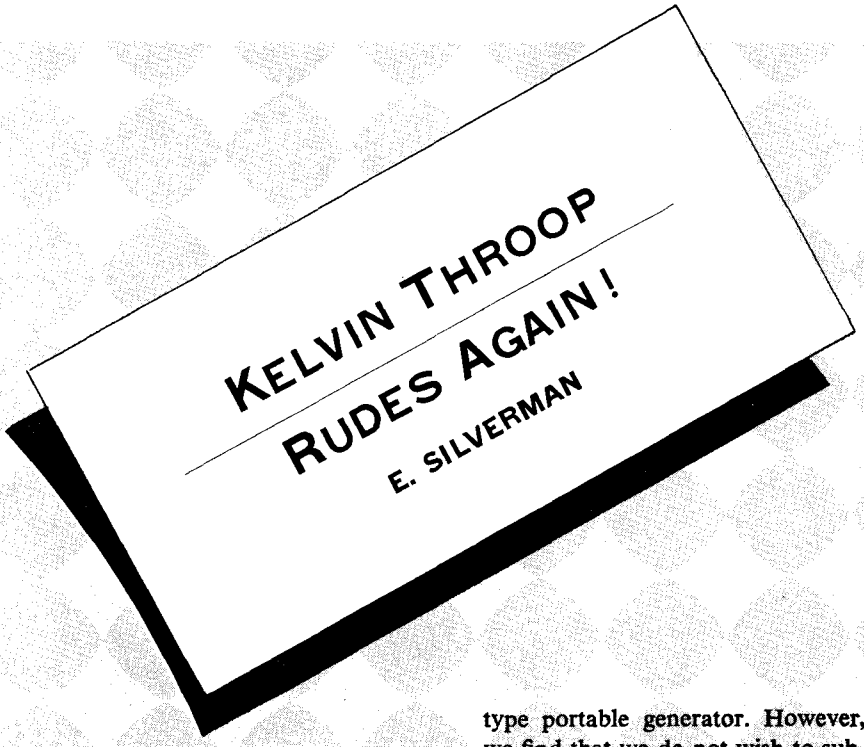

Kelvin Throop who vanished a while back, amid a flurry of most undiplomatic memos and notes has been found again! But again he's vanished. Readers are asked to watch carefully for, and report the presence of this highly deleterious individual. This viciously antisocial person who deliberately writes honest letters.

Material Command
Attention: Code 714595
Gentlemen:

Thank you for your kind invitation to quote on one each prototype portable generator. However, we find that we do not wish to submit a quotation at this time.

The real reason we are not quoting is that we don't wish to waste the time and money involved. We keep a comprehensive file on our competitors' products and we find that your specification was written by the simple expedient of extracting pertinent portions of our chief competitor's catalog sheet and pasting them up. We would be idiots to quote on something that is already in production by our competition. For one unit, the concept is even more idiotic.

Try us again when you really need something and are not just

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using us to attempt to get three competitive quotes.

Very truly yours,
Rowland Shew

Memorandum to J. Forland:

Your PERT diagram on the new solid-state control unit is sheer artistry. I have it hanging on the wall and every visitor goes into raptures about the new pop art.

Unfortunately, it is completely worthless as a scheduling aid. The genius who can procure all of the material in one week doesn't exist, at least in this plant. Also, you seem to have left out the little item of making the cabinet into which this gadget will go.

Incidentally, to whose budget did you charge the time involved in making this expensive wallpaper? I'd like to know.

Rowland S.

Dear Sir:

This will probably come as a great shock to you, but we could care less about your troubles. This company spent a small fortune having instruction manuals prepared so that semi-illiterates like you would have a fighting chance to use our equipment properly. You might try reading the two copies packed with the unit. If you still have troubles, ask our local jobber to spell out the big words in the instruction book.

V.T.Y.
Rowland Shew

Memorandum to K. Perasley:

Please demonstrate your fantastic ability as a purchasing agent to some other department. My requisition for one Alpha Model 2J24 meant what it said. I didn't ask for an analysis of comparative equipment nor do I have any intention of making do with something that is "practically the same" and probably twenty per cent cheaper. The equipment was designed for an Alpha unit, it is waiting for an Alpha unit, and I am two weeks late now on delivery.

Please buy one Alpha Model 2J24 and tell the other salesman that you will make it up to him some other time for the wonderful lunches that the two of you have been drinking together.

Rowland Shew

Dear Sir:

I congratulate you for your accomplishment of bringing the Oriental bazaar into this industry. Unfortunately, I don't have the time to haggle with you although I would dearly love to do so.

For the last time, would you please quote me a price and a delivery date for two 10,000-hour meters? I promise I won't tell any of your competitors.

If it will make you feel more secure, I promise to send my secretary to the ladies room when I open your letter.

V.T.Y.
Rowland Shew

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Dear Ed:

I am more convinced than ever that you were misassigned to this department. Your talents are being completely wasted here. Your inventiveness, for example, should be a valuable asset to our basic research group. I will do what I can to have you transferred there.

In the meantime, try writing your trip report again. This time, I'd like to see it a little more factual. I realize that to do so will make your expense account voucher a work of fiction, but that is something for you to work out with Accounting.

R.S.

Gentlemen:

Your questionnaire is very comprehensive, well done in format, and should get much information for you after you have someone run through a computer the answers that you get. However, you will have to do it without my contribution.

I didn't ask to be sent your "free" magazine. I am currently the recipient of three technical journals for which I pay good money. The last thing I needed was another trade magazine that prints rehashes of what other people have done and clever little circuit designs that work perfectly under conditions that will never again be duplicated. I will be forever damned if I spend the "only ten minutes" to fill out your form to justify my "right" to receive your monthly collection of advertisements with a pretty cover.

V.T.Y.

Roland Shew

P.S. You will note that my signature is spelled the way you insist it should be. I have never spelled my name that way, but your circulation people apparently know better than I do.

Attention: Code 45162
Reference: Contract No. 56-BF-4569-FY66
Gentlemen:

Your comments concerning our Acceptance Test Procedure Report have been received. Corrective action will be taken as required where applicable.

It is only fair to tell you, however, that we will not revise test No. 7 or the accompanying data sheets. Your required corrections indicate that, as usual, the Project Engineer does not understand the system. He doesn't know what the equipment was designed to do or what this test was intended to demonstrate. Since he has been on the project for only fifteen months, I guess it is too much to expect him to know what the system does.

Our Contract Administrator, by copy of this letter, is being requested to set up a conference on this matter. Please make sure that some senior engineer attends so that when I pound the table and scream

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there will be someone who can understand my frustrations.

Sincerely yours,
Rowland Shew

Memorandum to J. Cantino:

This is for record purposes. Attached is the department's proposal on the Air Force RFP for the airborne generator.

What we want to put on record is that the delivery date is ridiculous. I know that unless we lie, we won't get the job, but you and I both know that nine months delivery is impossible, beside being sheer wishful thinking. Judging from the date of the specification, this project has been kicking around for over a year. Now we are expected to put together something that is beyond the present state of the art in less time than that.

Good luck in the negotiations. For what they are worth, we have already faked the charts to prove we can deliver in seventy-seven weeks.

THE ANALYTICAL LABORATORY

AUGUST 1965

PLACE	STORY	AUTHOR	POINTS
1.	Trader Team (Conclusion)	*Poul Anderson*	2.33
2.	Half a Loaf	*R. C. FitzPatrick*	2.48
3.	Fighting Division	*Randall Garrett*	3.04
4.	Sleep No More	*James H. Schmitz*	3.31
5.	Positive Feedback	*Christopher Anvil*	3.65

SEPTEMBER 1965

1.	Space Pioneer (Pt. 1)	*Mack Reynolds*	2.05
2.	Say It With Flowers	*Winston P. Sanders*	3.43
3.	Psi for Sale	*Walter Bupp*	3.49
	Computers Don't Argue	*Gordon R. Dickson*	3.49
4.	Test In Orbit	*Ben Bova*	3.54
5.	The Life of Your Time	*Michael Karageorge*	4.01

OCTOBER 1965

1.	Overproof	*Johnathan Blake MacKenzie*	1.76
2.	Space Pioneer (Pt. 2)	*Mack Reynolds*	1.80
3.	The Mischief Maker	*Richard Olin*	3.16
4.	The Veteran	*Robert Conquest*	3.30

THE EDITOR.

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Of course, copies of these very imaginative documents are yours for the asking.

Rowland S.

Gentlemen:

You can't begin to know how sorry I am that I didn't know the salesman who covers our area. Your switchboard operator was absolutely right in refusing to connect me to just anyone who could provide information on your new power diodes. After all, if every caller could get the information he wanted, it might become simple to do business with you and you obviously don't want that to happen.

The real reason I'm writing is to let you know what we're doing at this end to assist in playing this game. Every day, I am setting up a number from one to one hundred. When your salesman calls, he must tell the receptionist what the number of the day is. If he guesses wrong, he must come back some other day. If he guesses right, he must then guess what my father's first name was. If he guesses right again, he is allowed to talk to a junior draftsman who is authorized only to ask for catalogs.

We do hope you will enjoy the game.

V.T.Y.

Rowland Shew

Memorandum to K. Brownley:

Those drawings you sent through are sheer beauty. They are also highly inaccurate. I refuse to go through another session of trying to keep track of change notices, revisions A through L, et cetera. Someone is supposed to make equipment from those drawings; they aren't intended to be objects of admiration. Take them all back and do the job right the first time.

R.S.

P.S. I've never met your secretary, but she has a charming voice. Tell her to use that charm on someone else. Also, tell her to stop asking who is calling. Your job in this company includes talking to people who wish to talk to you. When you get big enough to decide who you want to talk to, I'll see that you have the necessary promotion.

Dear Mr. Carslin:

That's a wonderful suggestion you have for improving our variable speed unit. I know that your many years of experience in using our types of products enables you to make improvement suggestions freely. We have a whole room full of units that were improved by your kind of hammer-screwdriver-pliers mechanic. Every one of them failed shortly after being "improved." Do us all a favor and keep your hands off the equipment. Meanwhile, I'll file your suggestion in the wastebasket where it belongs. We found out that it wouldn't work three years ago.

V.T.Y.

Rowland Shew

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Beehive / Mack Reynolds

CONCLUSION

Kelly Freas

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It seems a little stupid to say of men with a culture a million years beyond ours that these people are not intelligent. But in this case it was not only true—it was a fantastically dangerous fact!

Agent RONNY BRONSTON and Supervisor SID JAKES of cloak-and-dagger Section G, of the Bureau of Investigation, Department of Justice, Commissariat of Interplanetary Affairs are, one by one, exhibiting to chiefs of state of United Planets the deep-frozen body of a small, but obviously intelligent, alien life form. The surprised VIPs are shown the charred body, then conducted to a secret conference of some two thousand representatives of the most advanced worlds of the United Planets confederation.

Suddenly, newshen RITA DANIELS makes an attempt to crash the conference and is apprehended. Taken away, she is given Scop to find out who leaked the story, and then memorywashed. She reveals that BARON WYLER of the planet Phrygia was the source of her information.

At the conference, ROSS METAXA, commissioner of Section G, reveals to the assembled heads of United Planets that Man is in the clutch. Originally, when he began erupting into the stars, his colonies consisted of adherents of every socioeconomic, religious and philosophical theory ever devised by man. Any group able to raise the wherewithal, could go off and find a planet where they could develop their own Utopia. United Planets was formed, largely, to keep its membership from conflicting. Each member world was jealous of its institutions.

However, when the body of the small alien was discovered, it was realized by a small group on Earth, that man was not alone in the galaxy, and that the presence of other intelligent life meant that eventually the two cultures would meet. All indications were that the little alien was of a more advanced civilization.

Section G was formed secretly to subvert the institutions of the more backward membership planets, so that progress would result. Man must advance at the greatest speed, so that when the inevitable confrontation took place, he would be as strong as possible.

Now, a new element has arisen. The home planets of the little aliens

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have been discovered. Their life form has been wiped out. Oxygen breathers, the atmosphere of each of their worlds has been changed to one of methane-hydrogen-ammonia, obviously by some intelligent foe still further beyond. Metaxa demands that all differences between United Planets' worlds be brushed aside and all unite to advance the race as rapidly as possible in anticipation of eventually coming in contact with the new threat.

Baron Wyler, however, seems to have some irons of his own in the fire and takes off for his home planet. Ronny Bronston is sent to attempt to bring him around. On the spacecraft taking him to Phrygia he meets Rita Daniels again and conflicts with her. She radios ahead to warn Wyler that the Section G agent is on his way.

On Phrygia, Ronny meets Phil Birdman, local Section G agent, and is informed that Baron Wyler is the owner of Interplanetary News and uses it as a tool to promote his ambitions to bring all of United Planets under his personal sway.

Ronny realizes he must see the dictator, and has Sid Jakes make arrangements to have him named a plenipotentiary from the U.P. to Phrygia. With that title, he goes to confront Wyler and is surprised to find the man extremely likable and friendly.

Wyler admits his ambitions and contends that the strong man in history advances the race most rapidly. He also reveals that his planet is actually far ahead of Earth and the U.P. in investigating the two alien cultures. His technicians have been working on the worlds of the little aliens and have discovered information about the stronger culture still farther beyond. He tells Ronny that this race is fantastically advanced having such items as matter converters that can change anything into anything. He also reveals that they are man-like in appearance. And then he drops a final bombshell.

"These aliens don't seem to be intelligent."

VIII

If Baron Wyler had suddenly metamorphosed into a gigantic butterfly, he could hardly have surprised Ronny Bronston more.

"Not *intelligent?*" he protested. "A moment ago you said they had an unbelievably advanced technology. Fusion reactors and matter conversion units aren't exactly the products of unintelligent minds."

The Baron looked at him strangely. "Can we be so sure? Have you ever considered some of the things insects accomplish? However, neither as individuals nor as units such as beehives or anthills do we think of insects as intelligent. But the analogy isn't too good. A moment, please."

He got up, walked over to a wall

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screen and said something into it, then returned.

"You noted, of course, how humanoid our Dawnman was?"

"Humanoid?" Ronny blurted. "That was a *man.*"

"Perhaps." There was still a strange element in the other's voice.

The screen on one of the room's doors said, "Academician Count Felix Fitzjames, on orders to see the Supreme Commandant."

"Enter," the Baron said.

He made offhand introductions, then said to Ronny Bronston, "The Count has been specializing in this particular aspect of the matter. Undoubtedly, he will be pleased to enlighten you." He turned to the Count. "The matter of the nature of the Dawnmen."

"Dawnmen?" Ronny said.

The academician, who was an elderly scholar and obviously somewhat nervous in the presence of his ultimate superior, said, "Undoubtedly a misnomer, but one that has come into common usage among those who are working on the project. One hypothesis is that these aliens are the original Homo sapiens, that Earth was seeded from one of their planets."

Baron Wyler said affably, "Sit down, my dear Count."

The Count nervously sat, remaining on the edge of his chair.

Ronny said, "That's ridiculous. Earth is the origin of man."

The other nodded, apologetically. "Most likely, Your Excellency, however, there are those among us who think otherwise. You are undoubtedly aware of the theory that given the right conditions, man, or an animal considerably similar, would evolve upon various planets. The fact that he stands erect, that his eyes are so placed, that he has a voicebox and many of the other factors that go to make up the entity man—all have good reason for having evolved, and given similar situation would evolve on similar worlds to Earth."

"I've heard the theory," Ronny begrudged. "I haven't thought too much about it."

"Most authorities don't," the other bobbed his head agreeably. "However, there are certain factors that give credence to Homo sapiens' evolution elsewhere. For instance, we know that the earliest manlike creatures, *Zinjanthropus* and *Homo habilis* were in existence some two millions years ago, and utilizing very primitive tools and weapons. For two million years little progress was made. And then, almost overnight, in terms of history, modern man was on the scene. Some twenty or twenty-five thousand years ago Cro-Magnon man burst upon us with his advanced tools, his weapons, his religion, his advanced art."

"Advanced art?" Ronny protested.

"The cave drawings and paintings of the Magdalenian period in the Upper Paleolithic, especially in

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such places as Altamira in Spain and Lascaux in France are not primitive art as so many seem to think. It is a highly developed art, and without doubt connected with their religion. Consider a moment and you will realize that the very concept of religion is indicative of a sophisticated mind."

Ronny said impatiently, "I don't seem to get the point."

"The point," the older man said reasonably, "is that possibly Cro-Magnon man was not native to Earth, but was either seeded there, or was the result of an ages ago spaceship crash."

Ronny looked at him. "But there is no proof."

"Not as yet. Perhaps one day it will be found on the Dawnworld planets."

"Dawnworld?" Ronny said. Then, "Never mind." He looked at Baron Wyler who had been leaning back in his chair, quiet but beaming encouragement. "What's this got to do with this preposterous idea that the, uh, Dawnmen aren't intelligent?"

The Baron said, "Count . . .?"

The elderly scholar ran a hand back through thinning hair, as though unhappy. "Your Excellency, are you at all acquainted with the caste system of early India?"

"No." Ronny hesitated. "That is, not much. I understand that it was one of the reasons India never got very far."

The academician looked at him unhappily. "Well, that is debatable. From your name and your facial characteristics, Your Excellency, I assume you are of European extraction. Europeans seem to have arrived at the opinion that their efforts have predominated in man's development. In actuality, few, if any, of man's really great breakthroughs originated in Europe. Indeed, the Europeans came late on the scene and were largely brought into the march of civilization despite themselves. This particularly applies to the Northern Europeans who are even more prone than others to think of themselves as the undisputed leaders."

The Baron's chuckle encouraged the old man.

He went on. "When my own Nordic and Teutonic ancestors were wearing animal skins and tearing their food from bones before campfires, the Indians were developing such advanced concepts as the zero, in mathematics. I mention in passing that the Mayans of Yucatan used the zero even before India. While my ancestors lived in skin tents or inadequate shacks of wood and bark, large cities were being erected at Mohenjo-Daro and Harappa in the Indus River valley. Elsewhere in Asia and Africa, the wheel, the domestication of animals, agriculture, mathematics, astronomy . . . I could go on . . . were being developed. And my ancestors, and, of course, yours, Your Excellency. . . ."

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"And mine," the Baron laughed encouragingly.

". . . Were still in their animal skins. Why, the art of writing had developed, in different form, in various places about the world; in China, in America, in Mesopotamia, in Egypt. The alphabet we use today had its origin in Asia Minor. But to my knowledge, the Europeans had to import writing, never striking upon it on their own."

The old boy was evidently capable of dwelling upon nonessentials indefinitely, Ronny decided. "All right, all right," he said. "So the Indians made great strides, in spite of the caste system."

The scholar pursed his lips. "Or perhaps because of it?"

"Oh, now, don't be ridiculous."

Count Fitzjames looked apprehensive, as though he feared he had gone too far.

But the Baron nodded to him. "Go on, my dear Count. Tell us a bit more of the caste system and its origin. And why you think it analogous to the Dawnworlds' culture."

The other bobbed his head. "Yes, Your Lordship." He looked back at Ronny. "The origin of the system is lost in the mists of antiquity, but it is usually thought that when the Aryans invaded from the north, destroying the earlier culture, or assimilating it, they realized that unless they took stringent measures they would soon interbreed and merge with the more numerous conquered indigenous people. So they divided society into four orders, the *Brahmins,* who performed religious and scholarly pursuits; the *Kshatriyas,* who were the ruling class and warriors; and the *Vaishyas,* traders and businessmen. All these were composed of the conquering Aryans. Intermarriage between castes was forbidden, a deep religious matter. Below these three castes were the *Sudras* which were composed of the original peoples and took over the laboring jobs. Beneath these were the Outcastes, the untouchables, who were consigned to the most menial tasks.

"Now, consider. This system prevailed for a thousand years, two thousand years, or even more. A man born into the Brahmin caste became a scholar or religious, a Kshatriyas, a soldier or ruler, and so on. A man born into one of the subdivisions of the Sudras was a cobbler, if his father, grandfather and so on had been. It never occurred to him to seek education, beyond what was involved in learning to make shoes. However, he did learn to make shoes and make them very well indeed. On the other hand, it never occurred to a Brahmin born *not* to be educated. That was in the nature of things. It was inevitable. Indeed, did he fail in his studies and application of them, he had a good chance of being ostracized from society. What family would wish their perfectly normal, well educated, Brahmin daughter to

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marry a cloddy? There were exceptions, of course, but on an average and over a period of time, the outstanding scholar in the caste got the pick of the girls. I assume your knowledge of genetics leads you to the proper conclusions."

Ronny was looking at him thoughtfully. "I think I begin to see your ultimate point."

"Indeed. Actually, man on Earth has seldom come up with the type of socioeconomic system that developed in India. Oh, there have been some. The so-called Incas of Peru were one. You were born into your social strata and could seldom, if ever, leave it. The Inca clan supplied the warior-priests, the administrators; other clans supplied artisans; but most were of the soil and automatically became farmers." The old man looked up. "It worked, by the way, surprising well. The average inhabitant of Peru, at the time of the conquistadores, lived on a considerably higher level than did the average inhabitant of Europe."

"The anthill," Ronny said, an edge of distaste in his voice.

The Baron shrugged and smiled pleasantly. "Perhaps," he said. "We are not exactly advocating such a socioeconomic system, my dear Bronston; however, it has its admitted advantages."

"From your ambitious viewpoint."

"Granted. But the point the good Count is making is that man can evolve along such a path. He need not automatically follow the more individualistic road we most often witnessed in Earth's early development. On the Dawnworlds it would seem, if we interpret the information we've accumulated correctly, they have taken a path of specialization unknown even in caste system India."

"But what has this got to do with your claim that they aren't intelligent?"

"My dear Bronston, extrapolate a bit on the example the good Count gave you of the cobbler. Suppose that instead of being a cobbler for two millennia, he stuck to his specialty a megayear or so. No need for education, no need for anything except learning to make shoes."

"Yes, but such a cloddy doesn't invent a method of converting matter."

"Are you sure? Our cobbler doesn't invent a matter converter, obviously. His field is shoes. But as the centuries go by, and the millennia, a slight improvement in techniques here, a slightly different tool put into use there, and you'd wind up with some very nearly perfect shoes. Remember, by this time he *instinctively* makes shoes. Over the megayears the inadequate shoemakers, the throwbacks, have been weeded out. It has become a matter of genetics. The child born into the cobbler—let's call it caste—can make shoes without training. In the same manner that the bee takes no training to collect honey, nor the

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soldier ant to guard the community."

"But the matter converter?"

"Obviously devised by some other caste. Some caste which has been at work in manufacture a megayear or so. Undoubtedly, a member of this caste is no more capable of making shoes, other than putting them into a converter and copying them, than the cobbler is capable of producing matter converters, or fusion reactors."

The Baron pursed his lips. "Actually, of course, I doubt if they have cobblers at this late date. With the matter converter, such skills would disappear."

He looked suddenly at the elderly scholar, "That will be all, Count Fitzjames."

The Count scrambled hurriedly to his feet, put his hand over his heart in the salute he had made when he entered the room, and backed hurriedly toward the door through which he had come half an hour earlier.

When he was gone, the Baron looked at his visitor. "It's all rather mind shaking, isn't it?"

Ronny didn't immediately answer. Finally, he shook his head, as though to clear it, and said, "Frankly, I can't understand your reasons for letting me in on all this. Surely, you must realize I'll naturally report to Ross Metaxa."

"I hope not," the Baron said seriously, pouring the remainder of the light wine into their glasses.

All right, you've got it, Ronny thought. Start bouncing.

The Baron said judiciously, "Largely, what your commissioner reported to the chiefs of state there at the conference in the Octagon is valid. Man is face to face with his greatest crisis. Nothing can prevent our coming in contact with the Dawnworlds and their unique culture, sooner or later. Probably sooner than we would wish. However, where Metaxa and I differ is in the manner in which United Planets must be organized most efficiently."

Ronny said, bitterly, "You, the strong man, figure on enforcing union."

The Baron smiled and sipped his wine. "My dear Bronston, has it never occurred to you that your admired Ross Metaxa is a strongman himself?"

"He works within the framework of the United Planets Charter."

"Does he indeed? I am afraid only when it so suits him. His methods differ little from my own, in actuality. He is downright Machiavellian when he can achieve his purpose by no other means. For instance, in selecting his tools . . . his agents, such as yourself. I am sometimes surprised that young men of obvious integrity and idealism, remain on his, ah, team."

Ronny could see something was coming. Another curve ball.

Baron Wyler said decisively, his friendly eyes boring earnestly into the Section G operative's, "Bron-

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ston, we of Phrygia know the location of the nearest Dawnworlds. We are on the verge of sending an expedition there. We are of the opinion that it will be quite practical to land and observe sufficient of that culture to be able to duplicate some of their ultra-advanced devices." He twisted his mouth. "If not duplicate them, perhaps, ah, liberate one or two. It would seem that the matter converter is highly portable, for instance.

"I hardly need point out that the possession of such a device would put our planet into such a position of advantage that the whole of United Planets, even if they could be coerced into acting in full unison, could not stand against us."

The Baron came to his feet, and his personality seemed to fill the room to straining. "Reunited under the aegis of Phrygia, man, of all the three thousand worlds we have colonized, will march forward together. By the time the inevitable all-out contact between the Dawnworlds and our own is made, we shall be ready for these unintelligent, though highly advanced technically, antmen, beemen, call them what you will."

Ronny looked up at him, expressionlessly. "And where do I come in on this? Why have you told me about it? Why do you hope I won't report to Ross Metaxa?"

Baron Wyler smiled at him. "I would think that as sharp a man as yourself, my dear Bronston, would see what I have been leading to. I am as desirous of top operatives as is Ross Metaxa. I want you to join my forces, Ronald Bronston."

Ronny looked at him.

He came to his own feet. "I see. You want a man planted in Section G who'll keep you tipped off to the latest maneuvers of Ross Metaxa."

"Why mince words? Obviously."

The Section G agent's mouth worked. He said finally, "I'll have to think about it. Frankly, what's been said here in the past hour has set me back on my mental heels."

"Of course, my dear Bronston. Do not take too long is all. Events are on the march. We must not be dullards."

He made his way over to the wall screen he had utilized earlier and said something into it.

The same door through which the elderly Count Fitzjames had come opened again and Rita Daniels entered the room.

Ronny stared.

She said, a mocking quality in her voice, "Good afternoon, Citizen Bronston." He had noted the comparative drabness of the local women on the streets; here was the direct opposite. Not even in the most swank salons, in the most luxurious embassies in Greater Washington, could he have found a more stunningly turned out young woman than this. No Tri-Di star could have equalled this slim blonde; no artificially manufactured sex symbol, the pert prettiness of this girl.

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The Baron beamed at the two of them. "I understand you have already met my niece, Your Excellency."

Ronny Bronston closed his eyes in pain.

Rita said sweetly, "This was quite a little gimmick, getting yourself appointed a plenipotentiary from UP. Or do you maintain that you bore that rank before reaching Phrygia?"

Ronny bowed, wryly, "You seem to have a gimmick or so up your own sleeve, Citizeness Daniels," he said.

The Baron smiled his wide smile. "Whatever our friend's immediate methods, my dear Rita, he obviously can think on his feet, a desirable trait." He turned to Ronny. "My niece has been working, ah, incognito, with Interplanetary News, the better to learn the workings of our fellow worlds. However, I believe I shall in the future utilize her talents even more profitably. Had I known what Metaxa had up his sleeve, I would never have allowed her to try and penetrate that conference; I had no idea he would go to the extent of seizing and then memorywashing the poor girl."

He turned back to Rita, "And now, my dear, will you see our guest to his quarters? He has some important decisions to make."

IX

Rita took him up, by way of the private elevator, to the ground floor and through the pseudo-Minoan Palace to a hovercar ramp. As they progressed, silently, passers-by came to a quick halt. Civilians pressed their hands over their hearts in the same salute Count Fitzjames had given the Baron, soldiers came to stiff attention.

She looked at him from the side of her eyes, a mocking quality still there.

Ronny said dryly, "Like magic, isn't it? On Mother Earth, a lowly Interplanetary News reporter, sneaking into places she's not wanted. Being grabbed, manhandled, mauled, battered around, and then memorywashed. But now a veritable princess, the niece of the Supreme Commandant."

"What! Manhandled, mauled, battered around! Who dared!"

He looked at her as though in surprise. "Oh. That's right, you wouldn't remember."

She had stopped. Now she stood there, fists on boyishly slim hips, glaring at him. "You . . . you . . ." Then she caught his grin.

"Ha!" she snapped. "The last time you told me I had a bottle of guzzle, was drenched, and in trouble with a traffic co-ordinator."

He continued to grin, the mockery was in his face now.

She spun and marched on. "Some day I'm going to find out what happened to me during that twenty-four hours," she snarled. "And when I do . . ."

They reached a wide entryway

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which led off toward the gates down the ramp. Rita snapped something to one of the guards who spoke into a screen set in the wall. In moments, a low slung auto-car approached them. It was a two-seater, and Rita slid under the controls. She dropped the manual lever and took the stick, waiting for him.

Ronny got in beside her and they started down the ramp. He said, "I've got an official car waiting for me at the main gate."

"Let them follow. I wanted to talk to you."

"All right. My suite's at the United Planets Building."

When they passed the UP limousine with the marines, he gestured to them to follow.

Rita said, "What did you think of Uncle Max?"

"Uncle Max? Oh, the Baron."

"Maximilian, and a whole lot of other names and titles."

Ronny said warily, looking out over the countryside, "He surprised me." This whole area had been landscaped. All the way to the city. Phrygia evidently spared no expense in aggrandizing her Supreme Commandant.

She said, conversationally, "Have you ever noticed the extent to which man can delude himself when considering persons of whom he doesn't approve?"

"Such as strong men?" he said dryly.

"Exactly. Evidently, few consider that men such as Alexander didn't stand alone. Actually, he was the leader of a team. A team of military and political geniuses so capable that they were able to pull down the world's greatest empire. Men like Parmenion, Ptolemy, Antipater, Antigonus, Seleucus and all the Companions. Can you see the charm he must have radiated, the strength, the ability to draw men of great capability into his service? He must have indeed been like a god. Or Napoleon. Can you imagine the personality that man must have had, the charm, to draw together his team? Men like Ney, Marat, Bernadotte, Lannes, Soult and Massena."

She shook her head so that the ponytail she affected flounced back and forth. "No, Ronny Bronston, your strong men of history weren't dark villians with a mean glint in eye and dastardly deeds in mind. They were men of exceeding charm and strength, and they became strong men because of their superiority."

"How does Hitler fit into this theory?" Ronny said mildly.

"He's come down to us as the archvillain of all time. And I have no doubt that his victims saw him in that light. But his immediate team evidently worshiped him. Even men of the caliber of Churchill admitted his personal charm, his strength of personality. Without it, he would never have swayed the people he did."

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They were proceeding toward the capital city at full tilt now, the marines in the car behind having their work cut out trying to keep up with the speedy two-seater the girl drove.

Ronny looked over at her, not failing to note the spray of freckles dusted over her slightly upturned nose. "You seem to have read up quite a bit on history, especially the history of strong men." He paused, before adding, "Could it be because you see another strong man, Uncle Max, coming along?"

Ronny said, "I thought I'd think about it a bit. I don't change coats as easily as all that."

She slowed the car's pace a trifle and put a hand on his sleeve. She said, an element of inspiration in her voice, "Of course you don't. But man has come as far as he can, Ronny, along the path as it is now. We *need* a strong man. What a glorious race we could become, if, under the banner of Maximilian Wyler we united to march together into the future."

"What future?"

"Eventually, obviously, the complete domination of the galaxy, no matter what other life forms we run into as we progress."

"That's quite an order," Ronny said mildly.

"Don't be silly. I don't mean within our lifetimes. But only that can be the eventual destiny of man."

Ronny said, "Suppose I granted that the race could use a strong man along here, a man on horseback, as the term goes. What leads you to believe that Uncle Max is the man?"

She frowned at him. "But isn't that obvious? If he isn't, he'll never form his team, he'll never come to power. History is strewn with the wrecks of would-be strong men who didn't really have what was required."

He nodded agreement. "You're right, there. If Baron Wyler isn't the man he thinks himself, he'll land on the rocks, too."

She drew up before the UP Building and brought the vehicle to a halt although without setting it down. Her hand was on his arm again.

"Think it over, Ronny. My uncle evidently wants you on his team."

"All right," he said. "I'm thinking. Thanks for the ride."

He turned and taking two levels at a time, started up the stone steps. He didn't turn when he heard her sporter whisk away from the curb.

In the small apartment which had been assigned him, he immediately went to his bag. He brought forth a small object looking something between a woman's compact and a cigar case. He sat down at the table and propped it before him, activating it.

"Phil Birdman," he clipped out. "Soonest."

Birdman's mahogany face faded onto the miniature screen. "I've been waiting for you to call."

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"Get over here," Ronny rapped. "I'm at the UP."

"Right," the Indian's face faded.

Ronny said, "Irene Kasansky. Soonest."

Irene's perpetually harassed face faded in, and twisted into her version of a smile when she saw who it was. "Hi, Ronny, what's the urgency?"

"I've got to talk to the Old Man, immediately."

"No can do. Another big conference. He's browbeating fifty or more presidents, kings, patriarchs and what not."

"Give me Sid, then. And let the chief know I have to talk to him."

"All right, but Supervisor Jakes is busy, too."

Sid Jakes faded in, grin-wreathed as usual. "Ronny! Plenipotentiary Extraordinary! Frankly, in spite of that imposing tag, I thought the Baron'd have you into his deepest dungeon by now."

"Knock it!" Ronny clipped. "This is highest emergency. Everybody, but everybody, has been underestimating Uncle Max."

Sid Jakes' eyes widened slightly and his grin was a bit less bright. Not even in the seemingly lax Section G did an agent customarily tell Ross Metaxa's right man to shut up.

"Who?" he said.

Ronny briefed him on what had transpired.

The Section G supervisor ran a hand over his mouth thoughtfully. "Hm-m-m. I wonder how it'd work out if you told the Baron you're signing up with him? Then we'd have you on the inside of his organization."

Ronny said plaintively, "I keep telling you, this Wyler is no cloddy. The moment I told him that, he'd slip me some Scop, just to see if I was lying. Then, when he found out my passion for him and his ambitions wasn't exactly overwhelming, he'd see I had a few holes blasted in me."

Sid said. "Yeah. Possibly we'd better pull you out of there, Ronny. When you turn him down, the Baron isn't going to be very happy about the fact that he's revealed so much to you."

"You can't pull me out," Ronny said. "There's nobody else here but Phil Birdman and the Baron is about to send his expedition to the Dawnworlds. If it succeeds, and he gets some of those ultra-ultra devices the Dawnmen have, the fat's really in the fire. That matter converter, if I get a clear picture, with it he could duplicate himself a fleet of space cruisers that would outnumber everything UP has combined."

"You have no idea of where these Dawnworlds—where in Zen did that name ever come from?—are located?"

"None at all. The Baron learned through some of the things his people found on the little aliens' planets."

Jakes muttered, for once unsmil-

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ing, "Without co-ordinates, it could take us a millennium looking." He looked up again. "Listen, I'll get to Ross. Call you back."

While he had been talking, Phil Birdman had entered the room. Ronny deactivated the Section G communicator and turned to his colleague.

The Indian said, "Well, at least you're still with us."

"But how long that will be, I couldn't guarantee," Ronny told him.

The older agent sank into an auto-chair and dialed. "Pseudo-whiskey?" he said. "I have a sneaking suspicion I'm going to need a bit of firewater before I've heard all your story."

They'd got through two highballs apiece before Ronny had finished bringing him up to date.

When he had ended Birdman grunted. "There's only one answer," he submitted.

"What?"

"Let's go down to the recruiting station and join up with Uncle Max."

"Oh great, you overgrown funker. Funnies I get."

The communicator hummed. Ronny went over to the desk, sat down before it and activated the device. It was Ross Metaxa, at least as rumpled and weary as usual. He minced no words.

"That madman is taking a gamble in his bid for power, that could destroy us all. Our big chance was to put off for as long as possible first contact with these aliens. To stall for time. Now he's planning to set down on one of their planets, right now; to make immediate contact. He's drivel-happy! Well, there's nothing for it. Ronny, find out where those Dawnworlds are located."

"Yes, sir. How?"

"How in the devil would I know? You and Agent Birdman are there. I'm not. The nearest other agents to Phrygia are a good week's trip away. It's all in your lap."

Ronny Bronston looked at him.

His ultimate superior looked back, his eyes level.

On an impulse, Ronny blurted, "Was my becoming a Section G agent an engineered deal, not of my choosing?"

The moist eyes looked deeply into his own, without flicker. "Yes."

Ronny took a deep breath.

Ross Metaxa said, "Report through Irene as soon as you have anything." His face faded.

Ronny turned to Phil Birdman who had come up behind him to listen in on the conversation but had missed even the final sentences. "You better dial us another drink. Phil. We're going to need it."

The other his expression passive, got the drinks then sat down across from Ronny Bronston.

Ronny said slowly, "Phil, the Baron's working on a full time ba-

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sis on this project. That means somewhere, on or very near his person, is the information we need —the location of the Dawnworlds."

The Indian said nothing.

Ronny said slowly, "Phil, the Baron isn't quite as well informed on Section G as he'd like to think he is. There're a few little items that come out of the gimmick department that I'm willing to bet my life he hasn't heard about."

Phil Birdman put down his glass.

Ronny said, "Phil, one of us has got to go in."

"You mean . . ." The older man ran his tongue over suddenly dry lips. He said, his tone a blend of protest and apology, "I am forty-five, Ronny. There aren't many of the good years left."

"Metaxa would undoubtedly retire you immediately, on full pay, of course."

The other said lowly, "I don't want to retire. I like this work. Some day I look forward to making supervisor."

Ronny said, "All right. I'm only thirty-two."

Birdman looked up at him, his handsome Indian face working. "It's fifteen years off your life, Ronny."

Ronny Bronston nodded, a weary aspect in the gesture. "When I joined up with Section G, I figured I was expendable. This isn't as bad as copping a slug from some secret police goon on some backward planet where we're trying to upgrade their government, or some such."

He thought of something and said, "By the way, Phil. How'd you get into Section G? What led you to apply?"

"Oh, I didn't. Sid Jakes looked me up one day while I was still living back on Piegan. I was in the local police. We jawed around a little and before I knew it, I was in."

"Kind of got jockeyed in, eh?" Ronny said bitterly.

Phil looked at him. "I wouldn't put it that way."

Ronny got up and went over to the orderbox on the desk. He said into it, "I want the biggest whale of a meal you can concoct. Very concentrated, rich food, high calorie content."

Later, they retraced the route the marines had driven him earlier in the day. Phil Birdman was driving now, his own speedy hovercar.

Ronny was pensive. He said, after a long silence, "How close do you figure we can get? That's important. It'll cut time."

Phil said thoughtfully, "On that diagram you drew. You know that ramp this Rita Daniels mopsy took you to when you were leaving the palace?"

"Yes, sure."

"I can take you to the top of that."

"I think that's the private entry of the Supreme Commandant and his family."

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"I know. As soon as I get to the top, they'll order me to drive down again. That's perfect for us. Every split second can count, Ronny. It could be seventeen or eighteen years you know . . ."

Ronny Bronston said nothing. For that matter, it had been known to be twenty. Beyond that point, you inevitably died. You starved to death.

The hovercar bore diplomatic identification. The guards did no more than present their spears in a salute as they roared through the palace gates. Phil Birdman kept up a good speed. Not so high as to be conspicuous, but fast enough that their faces were unlikely to be spotted.

They got to the foot of the ramp and started up.

"You'd better take it," the Indian said tightly from the side of his mouth.

Ronny took a syrette from a small compartment in the dash and pushed it home in the back of his neck. He reached immediately for some of the energy pills.

Things were jerking frantically by the time they reached the head of the ramp and the *entrada* there, jerking frantically and already beginning to slow up.

A guard officer moved sluggishly toward them, more sluggish still. As he approached the car, his mouth, slowly, slowly, began to open. But before sound issued forth, he had stopped completely, one foot held in the air, his body in such position that it seemed impossible for him not to fall forward, out of balance.

Ronny Bronston vaulted over the side of the car and darted into the interior. He had done this but once before, in training, and had been under for less than ten seconds, pseudo-time. But this was the real thing. He darted a hand into his jacket pocket and gulped down more pep pills.

All was frozen.

He had no time to waste observing the utterly fantastic phenomenon. The world had stopped.

X

He retraced the route Rita Daniels had brought him along only a few hours earlier, dodging around the frozen statues that had moments before been soldiers and officials, clerks and secretaries in all their bustling activities.

He came to the private elevator that led into the depths that housed the apartments of the Supreme Commandant. This was his first serious barrier. There was no manner in which he could operate the machinery, nor any other machinery, save the equipment he carried.

He whipped out a laser gun, flicked the stud to cut and began beaming a hole through the elevator shaft door. Pure luck was involved now. He grabbed the door handle, and when he had almost cut the door away, pulled it toward

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him. It was a fantastically thick door. Evidently, Phrygia security took care that it not be easy to get at their Supreme Commandant.

Finally, the door began to fall toward him, slowly, sluggishly, but sped up by the effort he was exerting. It was as though he were pulling it through water, or even a thicker fluid. Before it had half reached the floor, he gave up his efforts and peered into the shaft beyond.

Luck was with him. Built into the metal wall of the shaft were ladder steps, obviously meant for repairmen and possibly as a last method of emergency exit from the quarters below in case of some extreme disaster.

He vaulted over the falling door, now arrested in its drop, and scurried down the ladder.

Ronny tried to remember how long it had taken him to get down to the Baron's apartments, when he had been there before, and couldn't. This was the crucial thing. If the other maintained his rooms five or ten stories down, that was one thing. If they were a hundred stories, that was disaster. He would starve to death in this shaft.

Which brought his needs to mind. He darted a hand into one of his pockets for another handful of energy pills, even as he descended.

Luck was with him still.

His feet hit the elevator cab.

He pulled the gun again, even as he gobbled pep pills, and cut a hole through the top of the elevator cage. He jumped on the circular, cutaway section so that it would fall. As soon as it had fallen sufficiently for him to jump off onto the elevator cage floor, he did so and turned the gun to the door, cutting that away, too.

Ronny pushed hard against the great inertia, forcing the door inward into the room beyond. He wedged himself through as soon as there was sufficient way.

He was within the Baron's apartments. Now he needed fortune's kiss indeed. Suppose the Baron wasn't here. Suppose, even though he was, he didn't have the information on him. Suppose he did have it but in such form that it was impossible to decipher.

Suppose a lot of things.

He darted his hand into another pocket for a supply of the energy pills and dashed into the room into which Wyler had invited him earlier in the day. It was unoccupied.

He headed for the door beyond, through which both Count Fitzjames and Rita had entered. Happily, it was open. He sped down the hall that was there, searching frantically. The living quarters of the Supreme Commandant of Phrygia were laid out in similar fashion, though utterly more swank, to any home of an extremely wealthy individual on a score of planets Ronny had visited. He had little trouble in guessing the layout.

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From time to time he would pass frozen statues in this dead world. Servants, guards, what were obviously secretaries or clerks, sometimes, if garb meant anything, evidently some high ranking Phrygia official.

Somewhere along here must be some sort of audience chamber, some sort of conference room, or whatever. It was unlikely that Baron Wyler would be eating at this time of day, and certainly not sleeping. Ronny was gambling on the possibility that he was at work, in conference with underlings, and probably deep in the project for sending the expedition to the Dawnworlds.

The gamble paid off.

He came to a large door guarded by two huskies in elaborate uniform, muffle-guns at their sides.

He wrenched at the doorknob, miscalculated and ripped it completely off.

Ronny snarled an obscenity, stepped back and flicked his beam gun up again. He repeated the process of cutting a circular hole large enough to pass his body, and then pushed the panel through. When there was space to see, he realized he had found what he sought. The Baron Wyler, standing at a table, a dozen men, mostly uniformed, also about it.

He pushed harder on the slowly falling panel, finally had the space to squeeze through. The Baron was standing, mouth closed, looking down the arch of his aristocratic nose at one of his subordinates who was speaking, his finger touching a chart. At least, he had been speaking at the moment of the freeze—his mouth was open. And remained so, though no sound issued forth during Ronny's stay.

Ronny Bronston darted to the table. He stared down at the paper the other was touching. It was a star chart, but not, he realized with sinking, one that could possibly have helped in the location of the Dawnworlds. It was a chart of United Planets.

Ronny sorted through the papers on the table, frantically. On the face of it, these men were discussing the broad subject of the Baron's designs against UP. If so, the subject of the Dawnworlds was obviously in mind.

But there was no other chart. Plans, reports, graphs, diagrams of this, that and the other. But no further charts.

He stepped over to the frozen statue that was Baron Wyler and ran his hands over the other. He went through every pocket, examined, however briefly, every paper. The other's body felt like clammy clay, there was a nauseating element in making physical contact with a living object under these conditions.

There was nothing pertaining to the Dawnworlds.

For the briefest of moments he wondered if it was all a hoax. Was

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the wily Baron planting the idea that he was in contact with this fabulous unintelligent race with the idea of bluffing the UP into accepting him as supreme? But no, the bluff might work with some, but hardly with others. Such planets as Delos were going to have to be shown something tangible before knuckling under to a Baron Maximilian Wyler.

Ronny Bronston's eyes began to dart around the room, inspecting the Baron's underlings. Which one might be expected to carry a star chart, pinpointing the Dawnman worlds? He simply didn't have time to search all. The only one he recognized was the self-effacing Count Fitzjames, who, characteristically, was back aways from the others, as though not wishing to intrude.

He grabbed energy pills from his jacket and munched on them. He had to think. No matter how desperate for time, he had to think.

He had been in this room already so long that he could note a slight change in the Baron's eyes. They had begun to widen a merest trifle, the first indication of surprise.

Then, as though magnet drawn, the Section G agent's attention whipped back to Count Fitzjames. What was the other doing over there, away from the others? Something hadn't at first registered on Ronny's awareness.

Yes! The oldster was looking at a . . . a map. No! It was a chart, a star chart attached there to the wall. Ronny whipped over.

Phrygia was heavily marked, down in this corner. Over here, surprisingly near, were the three star systems of the originally discovered tiny aliens. And beyond, all those numberless stars in red! They could only be . . .

Whether or not he was right, Ronny had no more time. No more time. He reached out and ripped the chart from the wall. Swore at himself for tearing it badly. Carefully and slowly pulled it down, folding it so he could carry it more easily.

He spun and dashed for the door he had blasted through, slowed somewhat by the resistance of the object he carried. He wedged himself into the corridor beyond. The panel he had cut out had not as yet dropped all the way to the floor, in fact, was not more than an inch or so lower than when he had finished shoving it.

In the corridor, the guards were beginning to react somewhat as had the Baron. Their eyes had begun to widen in shocked surprise.

He hurried down the hall, retracing his steps. To the elevator. Through the roof of the cage, up the ladder. As he went he desperately swallowed his energy pills, desperately crammed them down.

The ground floor could be no more than a few stories up, but he felt himself tiring. He was weary with the activity. He had been mov-

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ing at top speed since Phil had pulled the hovercar up before the entry. And he could feel it now.

At least, that is what he told himself he was feeling.

He refused the fear that was welling up inside. How long, how long?

He pulled himself at last through the hole he had burned in the heavy elevator door at the ground floor. He began to drag himself along the way to the entry, the ramp, Phil's hovercar and release. The star chart he carried grew increasingly sluggish, impossibly heavy.

And even as he went, he knew he wasn't going to make it.

The energy was draining out of him with every step. He had taken too much time. He had taken far too much time.

He went down on his knees, the star chart falling slowly from his hands, then remaining suspended in the air. He laboriously took it again. He had to make it to the hovercar. He stumbled forward. It was far too far.

He was too weak even to bring more pep pills to his mouth. The last few he had taken had had little effect at any rate. His body had taken all the punishment it was capable of taking. He wasn't going to make it.

This, then, was the ultimate failure.

He looked up in agony, down the long corridor that led in the direction of the ramp. The occupants of the hall were still frozen in their movements. For him, they would always be frozen. But . . .

He saw movement!

Down the hall toward him came running Phil Birdman, his eyes going in all directions.

He spotted Ronny, grabbed down at him, hoisted him over his shoulder and started back.

Ronny held on to consciousness. He didn't understand, but it was going to work out now. He held on desperately to the chart.

They were back in the hovercar. The Indian operative dumped him into the passenger seat, hurried around to the other side and vaulted into the driver's position. His hand darted to the dash compartment and seized two syrettes. He pressed the first into his own neck, the second into Ronny's.

Things began jerking frantically. Things began moving sluggishly. The people. The guards.

The guard officer who had been walking toward them when time had first stopped, began moving more naturally, faster, and still faster.

Scowling, he barked, "What's going on here?"

Phil Birdman said apologetically, "Sorry, officer. I seem to have ascended the wrong ramp."

"You certainly have! This is the private entry of the Supreme Commandant! What's going on here? You men look suspicious."

The Phrygian stared at Ronny Bronston. "What've you got there

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in your hands? You didn't have anything just a second ago."

It was the star chart.

Ronny shook his head, weakly. "Nothing. I . . . I feel sick. Let's go on back, Birdman."

"Yes, get out of here," the guard officer rapped. He was scowling, obviously wondering whether or not to arrest this pair.

Phil Birdman had never dropped the lift lever. Now he applied pressure to the velocity pedal, tipped the stick to the left and back, and spun the vehicle to descend the ramp again.

Ronny fumbled for a sandwich, gobbled it. Got it down and felt like retching. There was a bottle with a score of assorted pills. He got them all down. Drank deeply from a flask of water. He was dehydrated, weak, empty.

They were speeding toward the gate through which they had entered mere moments ago by straight time.

The gate was closing. The guards were milling about, anxiously. Four or five barred the way, spears raised.

Spears raised as though they were rifles, and it came to Ronny Bronston that appearances deceive. Baron Wyler wasn't about to arm his guards with nothing more effective than iron tipped wooden shafts. Those spears were undoubtedly disguised weapons demanding of considerably more respect.

"Blast through!" Ronny clipped to his companion.

Phil shot a glance at him. "If I do, we'll have the paleface cavalry after us in moments."

"We've got them after us already. What'd'ya think they're closing those gates for?"

The Indian's hand shot out, flicked a switch. Part of the dash fell away to reveal a pistol grip built into the car. Phil Birdman grabbed it, touched the trigger, slowly swerved the car right and left.

The gate and the soldiers that guarded it melted away into nothingness.

The two Section G agents felt nausea. It was seldom you took human life, even in the ultra-dedicated Bureau of Investigation.

They shot through what had once been the gate and down the road toward the city limits of Phrygia.

Ronny growled, "They'll be after us both in the air and on the road. Chances are, we'll never make it half way."

"It's getting dark," Birdman muttered. "Not that that'll make much difference. You got the location of the Dawnman planets?"

"I think so." Ronny wolfed another sandwich. "Listen, how did you ever find me? What was the idea? How could you do it?"

Birdman grunted. "I pressed my syrette a split second after you did. I was gambling that my metabolism wouldn't be hit until you had already been gone long enough to

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do what you could. I figured that you'd probably keep going, long after you'd passed the danger point, if you hadn't found what we needed. I figured I'd be going into pseudo-time, just in time to come looking for you."

He added apologetically, "It was all I could do. Of course, I was in pseudo-time only a fraction of the duration you were. I doubt if it makes more than a year or two difference."

"You cloddy!" Ronny growled. "Well, thanks." He knew well enough the other would have kept coming, looking for him, no matter how much time had elapsed.

"All for dear old Section G," Phil said cheerfully. "Listen, I can hear them behind us. We'll never make it."

"Keep going," Ronny muttered. "I'm beginning to feel the immediate aftereffects."

"Oh, fine," the Indian operative said. "You haven't got a communicator on you?"

"No, of course not. We couldn't take the chance of the Baron getting hold of one of us and finding the thing. He'd be able to tap Section G communcations."

The dash screen lit up. There was the face, the icy face of an officer in the uniform of Baron Wyler's personal guards.

The officer snarled, "You have exactly two minutes in which to come to a halt and surrender. Otherwise, we blast. You are not going to be allowed to reach Phrygia city limits. The Supreme Commandant's orders."

Ronny flicked the screen off. "Two minutes to go," he said. "Can you think of anything?"

"All I can think of," the other said expressionlessly, "is that we should have taken my earlier idea. Go down to the recruiting station and join up with the Baron."

"Too late now," Ronny grunted. "We've taken our stand. Look out, here comes a car toward us from the city."

"Probably a civilian," the Indian muttered. "There hasn't been time for security guards to be coming from that direction."

"Wait a minute!" Ronny said urgently. "I know that car. Stop."

The Indian shot a quick glance at him, but jammed on deceleration.

Ronny waved at Rita Daniels.

"Hey!" he called.

She came to a halt, her high forehead furrowed.

"What're you doing out here?" she said. "I thought you were in town thinking over Uncle Max's proposition."

He was feeling increasingly weak, but he climbed from Birdman's hovercar and made his way to hers, fumbling as he went for his gimmicked fountainpen.

He said, "Look. I want to talk to you. Come along with us."

Her eyes narrowed. She could

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hear the sounds of the pursuing guard vehicles. "Not likely," she snapped. "What're you up to?"

He flicked the stud of the device and turned to call weakly to Birdman. "Get the Baron on the screen. Soonest!"

He turned back to the girl. She was scratching her cheek where the tiny dart had struck her, and already her eyes were going blank.

"Come along with me, Rita," he ordered. Without bothering to see if she followed, he staggered back to the other hovercar.

Phil Birdman had managed to get through. Evidently, Baron Wyler had been stationed at a screen waiting for a report from his guards on the progress of the chase. His face was on the screen.

Ronny Bronston slumped into his seat, the drugged girl climbed in next to him; the slim figure, warm but unnoticed, against his side.

He said weakly, "We've got your niece, Uncle Max. She's going with us into Phrygia."

The Baron's face was blazing with anger. "Have you supposed altruists of Section G stooped to abducting helpless women and using them as hostages to protect your miserable selves?"

"You have said it, friend," Phil Birdman said flatly. He kicked the acceleration pedal with a foot, switched off the screen again to prevent the other from following their conversation.

Ronny Bronston had been hanging on to consciousness with considerable effort. Now he gave up. Phil Birdman had the ball. Let him demonstrate how he'd bounce it.

XI

Ronny came to, weakly, in the hideaway the Indian Section G operative had made himself in the suburban housing area of the Phrygian capital. Evidently, the other had just given him a draught of something highly stimulating.

"How'd you ever make it?" Ronny murmured.

Phil grinned down at him. Bronston was stretched out on a couch. "Ugh. Redman have no trouble shaking pursuing palefaces in confusion of big city traffic."

"Funnies, I get," Ronny muttered bitterly. "Where's the girl?"

"She's with us. Our strong man isn't as strong as he ought to be if he's thinking in terms of taking over whole empires or planets. He should have figured her expendable."

Ronny said, before passing out again, "Get the Old Man."

Phil Birdman went over to the desk and set up the Section G communicator. He said into it. "Irene Kasansky, soonest."

Her tight face faded in, her expression worried. "Phil Birdman," she said. "What's going on?"

"Give me the chief, Irene. Absolutely soonest."

"He and Jakes are waiting for your report."

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Metaxa's acid sour face faded in. "Birdman!" he growled. "What's happened to Ronny Bronston?"

The Indian said, "I've got him here. He's out." He had an edge of bitterness in his voice now. "He took your orders literally, of course. The only way of getting that information was for him to go into pseudo-time."

Ross Metaxa stared at him, unblinkingly. "How long was he under?"

"Evidently maximum. He probably set some sort of record."

The Section G head allowed himself to close his eyes for the briefest of seconds. He took a deep breath and said, "Did he get the information from that funker?"

"I think so. He brought a star chart away with him." Phil Birdman cleared his throat. "We also have a hostage. The Baron's niece."

Ross Metaxa assimilated that, not bothering to ask for details. He said, finally, "Have you any manner of getting out into space?"

Birdman hesitated. "UP has a small craft assigned to it. But if we utilize that, I have no doubt that the Baron will lower the boom on all UP personnel, the moment we're gone. He's got a reputation for ruthlessness when he gets excited about something."

Metaxa shook his head. "They'll have to take their chances. You and Ronny and the girl get yourselves out. There's a Space Forces cruiser heading at top speed for you. They'll be there in five days, Earth time."

"Then what do we do?" Birdman said, though he could see it coming. "Return Ronny to Earth for whatever treatment he can get?"

Ross Metaxa looked at him bleakly. "The Baron is going to head immediately for those Dawnworlds. You take off after him. In a week's time, Bronston will have recovered."

The Indian said flatly, "Ronny Bronston will never recover, as you well know, Commissioner. He's lost at least twenty years in that jazzed up phony-time he went into. Five years from now, he'll look and be twenty-five years older than he is today."

Metaxa said evenly, "He knew what he was doing, Birdman. He did what he had to do. He wouldn't have been Ronny Bronston hadn't he done it. He'll recover within a week. As you know, the age doesn't come immediately but over a period of time. For a while it won't affect him. When he has recovered, give him the story and make your way immediately after the Baron."

The Indian operative scowled. "How do you know the Baron personally will go out to the Dawnworlds?"

"Because when men like Maximilian Wyler really get in the clutch there's nobody they dare trust. He could never be certain that his closest right hand man wouldn't

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take over the reins, given some of those gismos the Dawnmen evidently have. No, you can be sure that the Baron will go himself."

His face faded from the screen.

Birdman looked at the now opaque screen for a long moment. "So everybody's expendable, including the complete UP staff on Phrygia. The party's getting rough."

Ross Metaxa had been right. By the time the four-man Space Forces cruiser reached them, Ronny Bronston was in his old shape. Good food and rest had done it. He felt the same as ever. All except, deep within, he knew that he had thrown

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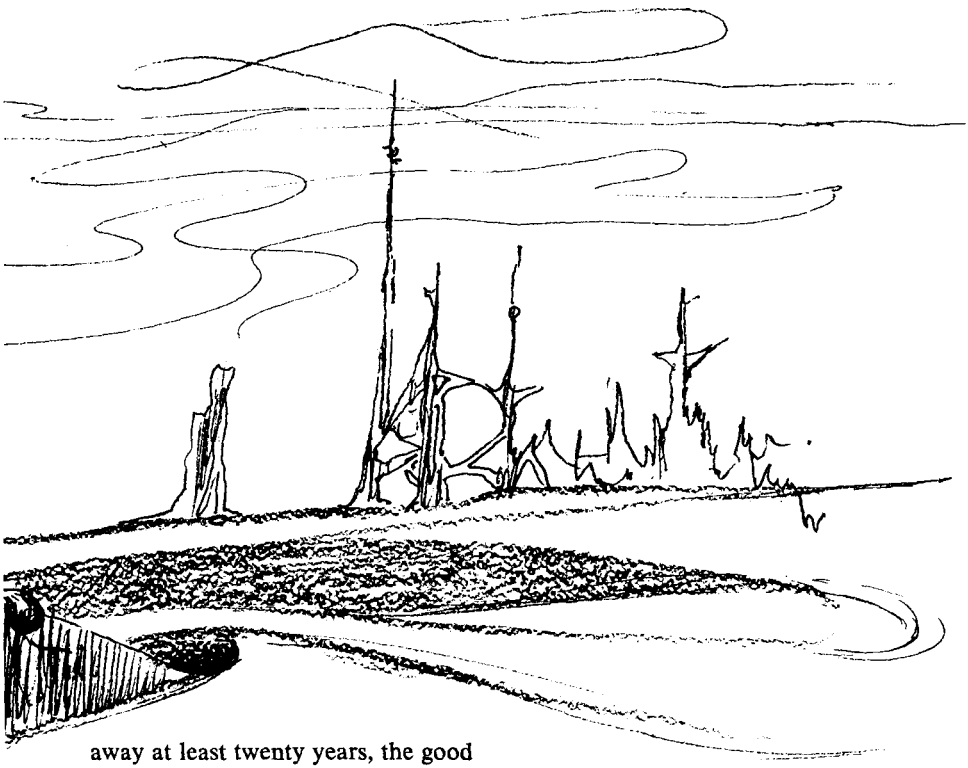

away at least twenty years, the good years, of life. A few Earth years from now and he would look and be as old as Metaxa himself. It wasn't the happiest of prospects.

No effort whatsoever was being made to apprehend them. The Baron's regard for his niece evidently precluded any attempt by the Phrygian space forces to find and destroy their craft.

It occurred to Ronny Bronston that if the girl was as close as all that to the would-be dictator, perhaps she had information about the man that might be of use in later developments. As he rested in the small space vessel that they had taken over from UP, he tried to pump her, though with precious little luck.

To the extent she could, in the confined space allotted to her and the two Section G operatives, she tried to ignore them. From time to time, though, temper flared and she allowed herself to be drawn into argument.

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The time, for instance, that she snapped out of a clear sky, "I don't see why you don't recognize that UP needs a leader such as Uncle Max."

Ronny said mildly, "Perhaps it does."

"Then why are you trying to hinder him? Why don't you join him?" she demanded.

Ronny looked at her wryly, "He hasn't proven to my satisfaction, as yet, that he's the man he thinks he is. Perhaps history will prove otherwise. As you pointed out the other day, it is strewn with the wreckage of would-be strong men who didn't make it."

"My uncle will make it!" You had to admit the girl's natural attractiveness was accentuated in anger.

"Meanwhile," Phil Birdman grinned at her. "There are a few of us who don't think so."

Ronny said, "Many aspire to supreme power, few are chosen. Take those examples you gave me the other day. Alexander, Napoleon, Hitler. They each supply a lesson.

"Alexander, for instance. He conquered the biggest empire known up to that time, but died at about my age from his inability to conquer himself. And when he died he left precious little. His immediate family, including his son, were killed off. That wonderful team of his fell apart, each trying to seize absolute power. Of them all, Ptolemy didn't do so badly; he and his descendants got Egypt as their chunk of the pie. But the next fifty years and more were spent by the Macedonians trying to find another strong man, and failing." Ronny twisted his mouth. "Their energies might have been put to better use.

"Or take your other example, Napoleon. He had his absolute power for a while, but he was still in his forties when they kicked him out and he wound up his life there on St. Helena. And his team? They didn't do so well either. Some turned traitor to him when the bets were down. Some were shot. Of them all, Bernadotte, who became king of Sweden, was about the only one who came out ahead.

"And Hitler . . ."

"Oh, he's the best lesson of all," Phil laughed. "That's the fella who taught me to believe in strong men."

Rita Daniels was flushing, and on her it looked remarkably good, Ronny Bronston decided. However, something came to him and he brought himself up. As a man in his early thirties, he could consider a girl of Rita's age and weigh her in the balance as a potential life companion. But as a man past fifty, as he would be, all too soon, it wasn't in the cards. If Ronny Bronston was ever to consider marriage, he'd better steel himself to the fact that he had better begin looking at widows in their middle-forties, not freckle-nosed girls in their twenties —no matter how provocative their ponytail hairdos.

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Rita said snappishly, "The end of the strong man isn't always disaster. Genghis Khan and Tamerlane founded dynasties. And though Alexander died a young man and didn't leave one, still it was through his efforts that Hellenism emerged and the Greek culture was spread from the Mediterranean to India. And Napoleon: When he stepped onto the scene, Europe was almost entirely feudalistic. When he left it there was a new and more progressive socio-economic system."

Ronny continued to needle her. "Whether or not Hellenism was an advance over the Persian culture can be debated, my dear. The Greeks wrote the history books, since they won the war, but there are some doubts about just how progressive they were. If Hitler had won his war, you can be sure that the villains who came down to us would have been Churchill, Roosevelt and Stalin, not Adolph the Aryan who would have been properly deified, as was Alexander before him."

Phil Birdman snorted and went over to check the control screens. "This waxes too intellectual for me," he complained. "I'm simple at heart. I just don't like guys in a position above me to make arbitrary decisions. Sometimes it hurts . . . me."

"Sometimes we need men with the ability to make quick, arbitrary decisions," Rita snapped.

"Yeah," Phil agreed over his shoulder. "But I like to be in a position to help decide who it's going to be. Any of these stutes with big ambitions will tell you they've got super abilities and you ought to let them make the decisions. But if those abilities of theirs aren't really so super, then I'm the cloddy who winds up crisp."

Ronny added mildly, "Our friend Hitler was a good example. He let the German people know he was the super man to end all. And they believed him."

"Oh, you're both flats!" Rita flared.

Ronny said, "Well, your Uncle Max is evidently making his play. I hope we're alive to see whether or not he succeeds."

Rita said scornfully, "If he makes it, my friend, I doubt if you'll survive long enough to enjoy the advantages of his guided political system." But even as she said it, her facial expression changed, and she looked at Ronny anxiously.

Phil, from the controls, laughed. "Touché. She's got you there, Ronny." He looked into a zoom-screen. "Hey, I think our Space Forces cruiser is coming in."

They considered, briefly, releasing the girl and allowing her to return to Phrygia in the small spacecraft they had taken over from the UP and which had been their home for the past week.

In fact, they called the UP Building with the intention of discussing

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her release, in return for leniency toward the United Planets personnel.

The only response was from a uniformed Phrygia security police colonel who informed them coldly that there were no longer any UP personnel in the building and that he was not free to discuss the situation. He inquired after the health of their prisoner but showed no emotion when he was told that it was excellent.

Phil Birdman looked at his colleague. "We'd better take her."

Ronny didn't like it, but he had no valid argument against continuing to keep an obviously valuable hostage. Whatever force the Baron had taken to the Dawnworlds with him, always assuming that their guess was correct and he actually was on his way, was most certainly more than this tiny Space Cruiser with its crew of four.

He said unhappily, "There'll be six of us in that small ship as it is. She'd make it seven. Besides, who knows what trouble she might kick up? She's fanatically for her Uncle Max and might try to blow us all up, just on the off chance that it might help him."

Phil Birdman looked at him questioningly.

Ronny said, "We'd have to have her under guard for the whole trip."

Phil said reasonably, "Why not put her into cold for the duration? We can arouse her as soon as we want her awake. It won't hurt her."

Ronny said grudgingly, "I suppose we could do that."

The skipper and the three junior Space Forces officers of the little cruiser were taken aback by the fact that they were to have a feminine fellow passenger. Not to speak of a pretty one. And not to speak of the fact that she was the kidnapped member of the royal family of Phrygia.

This particular vessel, the Space Cruiser *Pisa,* had been the nearest to Phrygia when the crisis arose. Ross Metaxa had thrown his weight around and quickly had the *Pisa* diverted to the trouble spot. The instructions were to put ship and crew at the service of the two Section G operatives. Captain Gary Volos and his three juniors hadn't the vaguest idea what the assignment was to be.

Rita Daniels didn't help matters.

At the first opportunity, and before Ronny could hardly more than begin his explanations to the Space Forces skipper, she had yelped, "I am being detained illegally. I am the Countess Rita Daniels Wyler, niece of the Supreme Commandant of the member planet Phrygia of the United Planets and these criminals are violating Article One of the United Planets Charter. I demand to be returned to my uncle's palace on Phrygia immediately."

Captain Volos was shocked. His eyes went from her to the two Section G agents in disbelief.

"Some squaw," Birdman muttered.

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Only then did it come to Ronny Bronston that he had been concentrating so long on the present emergency that he had forgotten that not one person in a billion, in the overall population of the United Planets, knew that the emergency existed. The average member of the human race had no knowledge of the existence of the original little intelligent alien life form, not to speak of the Dawnworlds and the Dawnmen.

He rapped, "Captain, your orders are to place your ship and yourself and men under the command of Agent Birdman and myself. We'll hold you to that."

Volos, staring, retorted, "My superiors made no mention of my condoning the breaking of the United Planets Charter. Do you deny this citizeness' words?"

Ronny shook his head wearily. "Substantially, she is telling the truth. However, the circumstances are drastic."

"Drastic!" one of the junior officers retorted. "How can anything be so drastic that the UP Charter be violated? Why, that's the reason for the existence of the Space Forces. That's why I joined it. To preserve the United Planets Charter—with my life, if necessary."

"Oh fine," Phil muttered. "A flag waver. Just what we need."

"You're going to have your chance to die for United Planets," Ronny snapped back, impatiently. "This young lady's uncle is attempting to subvert it. Right now, he's on his way to some newly discovered planets with a type of man far in advance of the . . . well, the human race. He hopes to get ultra weapons and techniques that will enable him to take over complete control of every planet, United Planets members and otherwise, which our species has colonized. That's why you were sent out here. To help us stop him."

The four spacemen were staring at him as though he had gone completely around the bend.

Rita saw her opportunity. "See?" she said. "He's out of his mind."

"Obviously," the flag waver said, his eyes wide.

"Knock it, Richardson," his captain ordered. "I'll take care of this." He turned back to the two Section G agents. "I don't know what's going on here, but I'm going to land and check with the local delegation of United Planets."

"That'll be a neat trick, as Sid Jakes would say," Birdman muttered. "The local delegation of UP has either been shot or thrown into the cooler."

"I keep telling you," Ronny said, trying to maintain reasonableness in his tone. "Phrygia is in a condition of armed aggression against her fellow members of UP and in revolt against the UP as a whole."

"You mean to tell me," Captain Volos demanded unbelievingly, "that this planet wants to take on all three thousand worlds of the UP and conquer them?"

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Rita laughed mockingly.

Ronny Bronston closed his eyes in pain. He opened them again.

He said, "Phil, cover them!"

A Model H gun flowed into Phil Birdman's hand.

XII

"Captain," Ronny said mildly, "Your orders are to put yourselves and your cruiser under the command of Agent Birdman and myself. We are going to insist you observe them."

The skipper's eyes went down to the gun. He obviously recognized the competent manner in which it was being handled. He probably also recognized the weapon and its potentialities. He checked his three juniors with his eyes. Even Richardson avoided the question in his commanding officer's face.

Captain Volos said coldly, "I am acting under coercion, Citizen Bronston, and wish that fact to be entered into the *Pisa's* log."

"Very well. Within a short time I'm going to prove to you what we've tried to put over. You don't seem to be a flat. When the proof is obvious, then Citizen Birdman and I will expect more hearty cooperation on the part of you and your men. Meanwhile, here is a chart. We are to head for the first of these sun systems marked in red."

The four hesitated for a long moment.

Birdman jiggled his gun, meaningfully.

The captain took the torn chart, scowled at it, took it over to his navigating table.

"Where'd you get this?" he said grudgingly.

"It's a long story," Ronny told him. "Once we get underway, I'll tell you at least part of it. Suffice to say for the moment that I liberated it from our friends on Phrygia who are trying to take over control of every human being alive."

The captain looked continued disbelief at him, but turned down to the chart in question.

Phil Birdman said cheerfully, "I think we'd better chill the squaw here, like I suggested, She's already caused enough trouble in just these past few minutes. What could she accomplish working on our cloddy friends, here, over a period of a couple of Earth weeks, or so?"

Rita looked at Ronny. "You plan to put me in cold?"

"Can you think of something better to do with you?"

"I refuse!"

He didn't bother to answer her.

"That's illegal!" one of the other junior officers said belligerently. "Illegal, without the permission of the subject."

The Indian laughed. "Friend," he said. "You're probably going to see one hell of a lot of illegality in the next few weeks, so you might as well start getting acclimated to it." He looked at Ronny. "You

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realize we're going to have to take this in shifts, don't you? We aren't going to be allowed to both sleep at once."

Ronny sighed and nodded. "Now let's see about this girl's shot."

The trip to the Dawnworlds went with little incident.

Ronny Bronston and Phil Birdman made no effort to interfere with ship routine and Captain Gary Volos' prerogatives. They conducted themselves as passengers with but one great difference.

They stood alternating eight-hour watches. Never was there a time when both slept. Never was there a time when their weapons weren't immediately to hand.

They had taken measures the first day to put the *Pisa's* small arms under lock, and remained the only men aboard with guns.

Largely, they spent their time playing battle chess with young Richardson, or with Mendlesohn or Takashi, the other two junior officers. The skipper himself refused to associate with the Section G agents beyond what was necessary to operate the spacecraft.

Ronny had thought he was making some progress with Richardson and Takashi, at least. Since they were going to be as exposed to the dangers of the Dawnworlds as anyone, he could see no reason for not giving the others all the information he held himself. This included a complete rundown on the true nature of United Planets and of Section G. It included the information about the little aliens, and the further information that this species had evidently been wiped out in their entirety by the Dawnmen.

He told them about the desperate efforts being made by Ross Metaxa and other ranking officials of the Octagon to bring complete unity to the United Planets, in order to prepare men for the eventuality of the touching of the two cultures. And he told them of Baron Wyler's ambitions and his present expedition to the Dawnworlds.

He had thought he had been making progress and was disillusioned the seventh Earth day after they had left the vicinity of Phrygia.

Phil Birdman had been playing battle chess with Mendlesohn, by far the best player aboard, which irritated the Indian since he rather fancied his own game. At this point, Birdman's double line of pawns were in full retreat before the other's strong armor attack. And Phil was muttering unhappily to himself, even as he tried to fight a delaying action until he could bring up his own heavier pieces.

Richardson, seemingly about nothing more important than crossing the small mess hall cum lounge for coffee, suddenly launched himself on the Section G agent's back.

Birdman, with no time to unholster his weapon, fell to the floor, the other clinging desperately to

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him, and tried to roll out. Mendlesohn, his eyes wide, scurried about the two threshing men as though not quite sure whether to throw his inconsiderable weight into the fray.

From the doorway, H gun in hand, Ronny snapped, "All right. Break it up. Richardson! On your feet, or I'll muffle you."

The aggressive ensign stood up, panting, his face unrepentant.

Phil Birdman sat there for a moment, shaking his head ruefully. "Why'd you stop it?" he growled at Ronny. "Now I'll never know if I could have clobbered the yoke."

Ronny said, "You're too old to be rolling around on the deck."

"Huh," Birdman snorted, pushing himself erect. "Look who's talking. It won't be long before. . . ." He cut himself short.

Ronny Bronston looked at him bleakly.

"Sorry," Phil said. "That's the trouble with wisecrackers. A supposedly smart quip gets out before you realize it's jetsam."

Ronny said to Richardson, "What was the idea?"

The other glowered resentment, in spite of the leveled gun. "What do you think it was? You've taken over the ship at gun's point. I was trying to recapture it."

The captain entered from the compartment entrance opposite the one Ronny occupied. "What's going on?" he demanded.

"This cloddy here is making like a hero," Ronny said mildly. "I'm afraid we're going to have to ask you to put him in cold, Captain Volos."

"He's a necessary member of my crew!"

Phil Birdman muttered, "He's about as necessary as a coronary."

Ronny Bronston, still holding the gun, said, "So long as we're in underspace, you could handle the ship singlehanded, Captain, as you well know."

"I refuse to put a man into cold without his permission."

Ensign Richardson glared defiantly at the Section G agent.

Ronny said mildly, "Then I'll have to shoot him. I can't afford to take the chance of having him loose. Next time, he might succeed."

"Not if he tried it on me," Birdman said nastily.

Ronny looked at Richardson, then the skipper. "The fat's in the fire, gentlemen. One man's life isn't very important."

Richardson said tightly, "Captain, I think he means it."

Captain Gary Volos rasped, "Very well, but I insist that this, too, be entered in the ship's log."

"That log is going to be plumb full before this trip's over," Birdman grinned.

Afterwards the two agents sat in the lounge alone over hot drinks.

Ronny growled, "It was lucky I couldn't sleep."

"Aw, I could've scalped that molly," the Indian grumbled.

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"Not if Mendlesohn would have got around to slugging you on the back of the head."

Birdman chuckled. "Two down and only three left to go. You think we'll ever get there without putting them all in the cold?"

Ronny said out of a clear sky, "Phil, why'd you join Section G?"

"Who, me?" The other seemed embarrassed. "I don't know. Better job than I had. Chance to see a lot of the different planets. Get out of the rut. That sort of thing."

Ronny Bronston went on, as though he hadn't really heard his companion. "When I was a kid I had the United Planets dream but good. Man exploding out into space, carrying our species to the stars. Going every which way, trying every scheme ever dreamed up from Plato's Republic to Howard Scott's Technocracy. Trying out every proposed ethic. Trying out a hundred methods of improving the race, by breeding in this, or breeding out that. Planets colonized by nothing but Negroes, others by only people over six and a half feet tall, others by Zen Buddhists, others by persons with I.Q.s of over one fifty, others by vegetarians, and on and on."

Phil snorted, missing the earnestness in the other's tone. "How about Amazonia? A few thousand feminists. No men at all, at first. Artificial insemination. Then when boy kids came along, they enslaved them."

Ronny said impatiently, "Sure, a lot of them are purely from jetsam, but they're balanced out by those that are finding new paths, new truths, and really advancing the species. The United Planets dream. An opportunity for everybody to try anything. But what's the ultimate aim? What's the goal? To dominate the whole galaxy, the way Rita sees it?"

Phil looked at him questioningly. "Does there have to be a goal?" He was beginning to catch the other's mood.

"That's my point. I wonder if there should be. I wonder if the dream wasn't going better before the Octagon stepped in and decided that UP needed direction."

"Well, you know how the Old Man would answer that. It was fine to let mankind take off in all directions back when we had no reason to believe there was other intelligent life in the galaxy. But when we ran into those little fellows, then we had to get under way."

Ronny's expression was strange. "But under way where? A comparatively small group of men, of Ross Metaxa's type, decided it was up to them to steer. But of what are they composed that they should know best? Why should Ross Metaxa, and his various supervisors such as Sid Jakes and Lee Chang Chu, be allowed to decide that the government of this planet Amazonia, for instance, should be overthrown and a bi-sexual regime en-

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couraged? Perhaps the matriarchy they're experimenting with is superior."

"Yeah," Phil grinned. "And perhaps not. Especially for *me*."

"Yes, but my point is, who is Metaxa to decide? There are tens of billions of members of the race. What makes him so special that he can throw Section G into a local situation on some planet colonized by this opinion group, or that, of their own free will and conscious of what they were going into?"

At long last Phil Birdman turned thoughtful. "Maybe I don't know the answer," he admitted. "And maybe my decision was a wrong one. But I'm in my mid-forties now and I took my stand quite a time ago. I'm not going to change it now." He looked at Ronny. "Are you?"

Ronny said: "I wouldn't know what to change it to."

Ronny Bronston came up behind Captain Volos who was standing watch in the *Pisa's* control compartment. He said, "What's wrong?"

The skipper was bug-eying into a zoom-screen. "A spacecraft! I've never seen another ship in underspace before. But . . . but that's not it. It's the size. It's as large as a medium sized satellite."

Ronny said, "Let me see."

The captain grudgingly made room for him.

"I don't see anything," Ronny said.

The captain scowled at him and bent over the horizontal screen again. "It's gone!" he blurted. "It can't be gone!"

"We seem to be approaching the Dawnworlds," Ronny said dryly. "From what little I know about the Dawnmen, shortly we're going to be witnessing a good many things that simply can't be."

Gary Volos was still gaping into the zoom-screen.

Ronny said, "How far out are we?"

The captain at last stood erect. "Not very far," he said. "I can't be too sure. I have no references except that chart you gave me. Possibly the co-ordinates are off. However, we should be coming out of underspace before long."

He looked at Ronny Bronston with puzzle in his face, and also a touch of accusation. He said, "That craft I just saw was far and beyond anything that could be built on any United Planets world."

Ronny said mildly, "I told you that the Dawnworlds are evidently fantastically beyond us technically."

Volos shook his head. "I didn't believe your story. I didn't know what your game was, but I didn't believe this tale about other intelligent life forms."

"Well, Captain, you'd better start thinking about it. The more cool minds we've got around when we come out of underspace, the better off we're going to be. We have only one small bit of evidence that

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these critters won't crisp us immediately upon our materializing."

"What's that?" the other said, a shade of apprehension in his tone now.

"Those little aliens had photographs, both still and movies, of them. That would indicate that the little fellows actually landed on at least one of the Dawnworlds and were allowed to use whatever camera devices they had and then leave again."

He indicated the chart on the navigation table. "And that star chart. It shows hundreds of star systems in red. I've assumed that those are all Dawnmen settled. The little fellas must have sent out various expeditions to compile that extensive a chart. Which means in turn that the Dawnmen allowed them to do it."

"Didn't you say that the atmosphere of the planets the little aliens were on was changed to what was poison for them?"

"That's right. Eventually, they must have done something to irritate these Dawnmen, but before they did they must have done considerable exploring about the others' domains."

Ronny thought for a moment, then said, "I suppose you might as well start the process of reviving Rita Daniels and young Richardson. We're not going to be in any position to remain divided among ourselves after breakout from underspace."

"All right," the captain said nervously. He spoke into an orderbox.

Ronny said, "Look. This trip hasn't been any too happy, thus far, which isn't surprising. But now that we're here, I want to let you know that so far as the operation of the *Pisa* is concerned, Agent Birdman and I want to co-operate. You're the captain. We'll follow orders."

Volos looked shamefaced. "My instructions were to put myself and command under your orders. I'm sorry I got around to following them so tardily. Very well. I captain the *Pisa,* but the overall decisions are yours."

His eyes flicked to the control panels. "We're coming out." He reached over and threw an alarm.

Within moments, Birdman and Lieutenant Takashi hurried into the compartment.

Takashi, his characteristically bland face showing unoriental-like excitement, said, "Mendlesohn's bringing the others out of the cold."

The captain said, "We're emerging."

They came out in the planetary system of a sun remarkably like Sol, and within reasonable distance of a planet most remarkably similar to Earth.

The captain muttered, "The coordinates were as perfect as any I've ever seen. Much better, in fact."

Phil Birdman said, "We told you, those little aliens were far and gone

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in advance of us. Evidently in interplanetary navigation as well as elsewhere."

Rita Daniels and Ensign Richardson, both looking a bit green about the gills, came into the compartment, cups of some steaming broth in hand.

The captain, his eyes magnetized to the large screen which took up a full half of one control compartment wall, threw a lever. Richardson put down his cup and slid into a control chair, so did Takashi.

The captain said to Ronny Bronston, "Well?"

Ronny shrugged. "Why put it off? Let's go closer." He had an afterthought and said, "You people have some method of detecting any craft down below using nuclear propulsion, haven't you?"

"Of course. It's part of the equipment utilized to locate possible wrecks of spacecraft which have crashed."

"Could you locate the Baron's ship, or fleet, as the case may be?"

Volos frowned. "Why do you think he's here? There are hundreds of star systems on that chart."

"I'm not sure he is," Ronny told him. "But this is the nearest of them all. Why should he go farther, if he's in a hurry?"

Rita snapped, "I demand to be put in instant communication with my uncle!"

She was universally ignored, even by young Richardson.

"We can detect him easy enough," Volos said. "But how can we tell if it's he, rather than one of these Dawnworld craft? Although I suppose it's possible that they no longer use nuclear power."

Richardson turned and stared at him. "Has he talked you into believing that jetsam, sir?"

"I saw a starship at least a thousand times larger than anything in United Planets," his skipper told him without inflection. "Mr. Richardson, and you others, consider yourselves under the command of Citizens Bronston and Birdman. Countess Wyler, if that is your correct name, you attempted to confound me. Please keep in mind that I am captain of this vessel, no matter who your uncle may be. I expect the respect and co-operation of everyone aboard."

It was half an hour later before he spoke again.

And then it was to say, "On the face of it, below we have one of your Dawnworlds. It could be nothing else."

Below them was a world that was a park.

XIII

It was as though you took a planet, approximately the size of Earth itself and transformed the whole into a landscaped garden. As though you made of the whole a cinema set portraying the Garden of Eden, the Garden of Allah, the Promised Land, the Islands of the

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Blest, Zion, the Elysian Fields . . . what will you for Paradise?

Rita Daniels hissed her breath in.

Takashi said shakily, "I can detect a nuclear powered ship. Only one. Seemingly larger than our own size."

Rita said, unthinking, "Uncle Max's yacht. It's the fastest . . ." Then she clammed up.

Ronny said, "Try to pinpoint it, Lieutenant." He looked at the captain. "No radio contact? No nothing?"

The captain shook his head. "I would think there would be some sort of patrol. Some sort of defense mechanism. But there doesn't seem to be. I can't even pick up any radio waves."

"Possibly they don't use radio waves any longer," Birdman muttered.

Richardson looked at him in disgust. "You've got to use radio waves," he said. "You can't run an advanced technology without radio waves."

Phil Birdman said, "You mean you can't run *our* technology without radio waves."

Richardson blinked. "Just how far ahead of us are they supposed to be?"

Nobody answered him.

Ronny said to the captain, "What do you say we orbit her a few times, coming closer slowly?"

Several hours later, it was Rita who said, mystified, "But there aren't any cities."

And Phil Birdman said, disbelief in his own voice, "Maybe they don't use cities, either."

Takashi said, "There are a few worlds in United Planets that don't have cities."

"Yes," the captain muttered, "but the most backward of all. Places like Kropotkin, the anarchist experiment, and the planet Mother, with the stone age naturalists. By the looks of this world, the whole thing has been landscaped. That's not exactly within the capabilities of either anarchists or nature lovers who refuse to utilize any inventions more complicated than the bow and arrow."

Ronny said thoughtfully, "Early man didn't have cities. They first came in as defense centers for the new developing agriculturalists, against raiding nomads. Later on they became centers for trade, and when social labor came in, large numbers of people had to live close together to work in manufacture."

"What are you getting at?" Rita said.

"Well, perhaps these people, if they actually have matter converters, no longer need manufacturing or trade. No longer have to live in each other's lap."

The captain muttered, "I can't even make out individual houses. Or, for that matter, any signs of agriculture."

Mendlesohn said, awe in his voice, "Do you think that this could be a whole planet just devoted

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to being a park? Possibly their other planets are so built up and crowded that they've kept this one just for the sheer beauty of it."

Phil Birdman said, "Look at that herd of deer, or whatever they are?" His voice tuned low. "The Happy Hunting Ground."

"What?" Ronny said.

"Nothing. How long does it take to breed out of a people the instinct of the chase?"

Takashi said suddenly, "There. There's a city for you. And it's not too far from where I detected the nuclear powered spacecraft."

It was an area of possibly a square mile and the buildings were unique, even at a distance.

The captain looked at Ronny Bronston.

Ronny thought about it. "Let's drop closer," he said. "From all we know, if they'd wanted to crisp us they could have done so long before this. A race that could produce a spaceship as large as the one you saw, would have weapons to match."

They hovered over the complex of buildings, descending slowly, until the screens could pick out considerable detail.

"There in the center," Richardson said. "A pyramid. It looks like a Mayan pyramid."

"What is a Mayan pyramid?" Rita said. Her voice held the same awe of this strange world as did the others.

Ronny said, "Your Earth history has been neglected, my dear. You spent too much of your time reading up on the strong men. The Mayans were an early civilization in the southern part of North America. They . . ." He broke off suddenly as something came to him. "This isn't a city. It's a complex of religious buildings. Maybe schools, things like that, too. But it's not a city. Not in the sense of large numbers of persons living in it."

"There's one thing for sure," Phil nodded. "There aren't a good many people down there. What's that, on top of the pyramid?"

The skipper focused the small zoom-screen, quickly flashed it off again, his face pale.

"What's the matter, Captain?" Richardson said. "Why didn't you throw it up on the large screen for the rest of us?"

Volos said to Ronny tightly, "Didn't you tell us that these so-called Dawnmen were sort of a copperish color?"

"That's right. Great, beautiful physical specimens. Rather a golden color."

The captain fiddled with his small zoomer again, finally located something and switched it to the compartment's large screen for all to see.

It was a small group of the Dawnworld people, both men and women. All were dressed in no more than loin cloths, or short

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kilts. All seemed approximately twenty-five years of age. All were in obvious sparkling health.

"These, eh?" the captain said, his voice strange.

Ronny looked at him. "Yes, of course. Those are the Dawnmen. They don't look particularly hostile or aggressive, do they?"

Volos said very slowly, "That wasn't a Dawnman on the top of the pyramid."

Ronny said, "If Baron Wyler is in the vicinity, it means two things. No matter how much of a head start he got on us, he hasn't managed to get what he came after, as yet. Which means, in turn, that we've got to get a move on."

All the others looked at him.

"Well, what's the program?" Birdman said.

"The Baron—if that's his craft we've detected—is on the ground," Ronny said thoughtfully. "We're going to have to land, too. Skipper, what say that you edge over a mile or so, beyond the limits of this city, or whatever it is, and drop one of us to reconnoiter?"

The captain turned to his control panel, silently.

He drifted the *Pisa* to the north, brought it down carefully in what was seemingly an isolated glen, devoid of life.

Ronny went to the hatch, Birdman and Takashi accompanying him, the others remaining in the control compartment, glued to the screens.

Lieutenant Takashi eyed the scanners built into the bulkhead over the hatch. "Almost identical to Earth atmosphere, Bronston," he reported.

Ronny said, "Well, here goes nothing, then."

The captain came up behind them.

"Citizen Birdman, Lieutenant, would you leave me with Citizen Bronston for a moment?"

Phil's eyebrows raised and he looked at Ronny, but then shrugged and following the junior officer, went back into the control room.

Ronny said, "What was it you saw at the top of the pyramid?"

"That's what I came back to tell you. I thought perhaps you'd just as well not alarm the girl—and the balance of the ship's complement, for that matter."

Ronny looked at him.

The captain cleared his throat. "It was what seemed to be an altar, and on it, a man."

"A Dawnman?"

"An Earthman. Or, to be more accurate, I suppose, a Phrygian. But at any rate, a member of the human race, not a Dawnman."

Ronny sucked in air. Finally, he said, "All right. Drop me. Then take off again. I'll keep in touch, through Agent Birdman. If anything happens to me, he's in command."

"Right," Volos said. There was a certain respect in his voice now, which had hardly been there in his

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early dealings with the Section G operatives.

When Ronny Bronston was about a good thousand yards from the *Pisa,* he turned and waved, and seconds later it lifted off. He watched it fade away, upward and out.

He turned and looked about him.

It was still a park. A garden. A golf links.

He shook his head in disbelief.

And not ten feet from him, what could only have been some sort of door opened on empty space. For the briefest of moments he could see into what would seem to be living quarters of a man-type being. Chairs, tables, decorations . . .

But then a body blocked his view. A Dawnman came out and began walking toward him. The door, or whatever the opening might have been called, closed again.

Ronny was gaping, his jaw sagging. He shook his head for clarity.

The Dawnman, walking briskly and looking to neither left nor right, passed him by no more than three feet.

He could have stepped out of a Tri-Di stage which had been projecting a tape of that fabulous hero of yesteryear, Tarzan. He could have stepped off a pedestal in a Greek temple devoted to the god Apollo. He was approximately six and a half feet tall and would have weighed approximately one hundred and ninety. His skin was golden, his hair dark cream. His eyes were blue and very clear, and there was the slightest of smiles on his lips.

He wasn't ignoring Ronny Bronston blindly, he was ignoring him enthusiastically, avidly, even vigorously, if that made sense.

He walked right on by and went about his business.

Ronny stood there for a long moment, blankly.

Perhaps the other was blind.

No. Ridiculous. A man didn't stride along as carefree as this young man was doing, without benefit of sight. The other was about to top a slight hill, and would be lost to view. On an impulse, Ronny ran after him.

He called, "Say!"

The Dawnman either didn't hear, or didn't bother to answer. He strode on. Back from him floated a trill of song. Well, not exactly a song. Sort of a happy cross between song and whistle. It had a beautiful lilt.

Ronny called, realizing that the use of Earth Basic was ridiculous, "Wait! I want to talk to you!"

But the other passed over the rise and by the time Ronny Bronston got to the top of the hillock, the Dawnman had disappeared.

Ronny looked about him, bewildered. There was no place for the other to have gone in such short order. But then he remembered how the Dawnman had

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emerged from what had seemed open space. Without doubt, he had disappeared into another such . . . such . . . What was it?

And even with these thoughts in mind, Ronny walked full into . . . what was it? He smashed, at full pace, into an invisible barrier. He sat down, abruptly, his hand to his nose, which he at first thought must be broken. It wasn't. In a couple of minutes, still sitting, he got the nosebleed under control.

Then he stared accusingly . . . at what? At nothing. Immediately before him seemed a beautifully kept lawn leading to a small grove of trees. Beyond the grove he could see a stream of unbelievably clear water.

He reached a hand forward, tentatively.

He could feel . . . what? A glass-like substance? He supposed so. He traced it from the ground up as far as he could reach, and then he walked slowly along it, ever feeling.

Seemingly, it was a wall. But he could see through it perfectly. No matter how close he brought his eyes, he could not see it, however.

He could hear his communicator hum in his pocket. He took it out and flicked open the lid. Phil Birdman was on the screen.

He said, anxiously, "For a minute, there, we thought we saw one of these Dawnmen right near you."

"You did."

"Well, what happened to him?"

Ronny said sourly, "He evidently came out of one house, walked down the street a ways and into another."

Phil said, "Are you all right?"

"Except for a busted nose, I'm all right. This planet isn't depopulated. They evidently just don't like the idea of cluttering up the scenery with a lot of buildings, so they camouflage them. For all I know, I'm in the middle of a big city right now. No, I guess I couldn't be, or I'd see more people out here in the open."

"Camouflage? We don't see any camouflage."

"Oh knock it," Ronny told him. "It's *perfect* camouflage, of course you can't see it. Have you got in touch with Earth?"

"Right. I talked with Sid Jakes. He said to play it by ear."

Ronny grunted. "Tell him I'm playing it by nose, instead." He flicked the communicator off.

With no other idea of what to do in mind, he walked in the direction of the city, or religious buildings, or whatever they were.

He rounded a bend and came upon what could only be a picnic. A group of the Dawnpeople, about ten of them, were seated on the bank of a stream. There were both men and women, all seemingly somewhere between the ages of twenty and thirty. All absolutely perfect physical specimens. If anything, the perfection was its own drawback. They were, Bronston decided, too perfect.

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Not a woman nor a man among them but wouldn't have met the highest standards of TriDi sex symbol back on Earth, or any of the other planets that continued the fan system of theater. No Greek goddess could have rivaled a single of these women in pulchritude. Paris would have had his work cut out, choosing to whom to give his apple.

Ronny hesitated. Obviously, these people were at their leisure, enjoying themselves. He disliked to intrude.

But then it came to him that given fusion power and matter converters, they must have considerable in the way of leisure. Besides, they would be interested in him as a complete alien.

He stepped nearer and said, "I beg your pardon," feeling like a flat at the words, but the ice had to be broken somehow. He assumed that a race this advanced would have some method of communicating with him. Some technician who . . .

But then Baron Wyler's words came back to him. That these Dawnpeople were not intelligent.

Nonsense! On the face of it . . .

But on the face of it, they didn't even see him.

He stepped closer.

They went on with their picnic, if that's what it was. They ignored him, completely, enthusiastically. He stepped so close that they couldn't possibly have missed him.

And it wasn't as though they were blind. He could see them performing actions that obviously required the co-ordination of hand and eye.

One of them, an absolutely perfectly formed girl wearing nothing but sandals and a colorful kilt, picked up a handful of sand and gravel from the stream's bank and turned with it to a low table. There was, on the table, a device that reminded Ronny of nothing so much as a primitive coffee grinder he had once seen in an Earth museum. She poured the dirt into a funnel-shaped hole on the top and touched a switch or stud.

She opened a small door and brought forth what was seemingly a piece of fruit, though unrecognizable as to type by the Section G agent. She began to munch it.

Ronny Bronston closed his eyes in surrender.

He said, in sudden exasperation, "Look, won't somebody give me a steer?"

They still didn't notice him.

He looked at the gathering more closely. There were several of the coffee-grinder devices. Evidently, they were in continual use. Some of the Dawnpeople were drinking from intricately shaped glasses, some eating various unidentifiable foodstuffs. They laughed. One or two sang from time to time in the strange trilling manner he had heard earlier from his first contact.

They were obviously having one whale of a time.

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He stared at the devices.

With unbelievably good luck, he had stumbled, within a half hour of the first landing on the Dawnworld, on one of their matter converters. They were paying no attention to him. He might as well have not existed. Suppose he took one of the things up. What would they do? It was hard to believe that any of these people were apt to resort to violence. And most certainly they carried no weapons.

But that gave him pause. Given the occasion, who could say but that they were capable of pouring a handful of sand into one of their gismos and bringing forth a pistol to end all pistols?

But this was his obvious chance. For whatever reason, the Baron was evidently still on this planet. His expedition, thus far, had failed. If Ronny could acquire one of these working models of matter transformers, Section G's technicians could possibly take it apart, duplicate it, come up with larger models.

He went so far as to tentatively reach forth a hand toward the nearest. They continued to ignore him. By not a flicker of eye did they admit to his presence.

Ronny drew the hand back.

He wondered wildly if he was invisible to them. But no. Obviously these people were human. Perhaps not exactly of his genus, but most certainly they were of the species Homo. This world of theirs had obviously been landscaped to please their own taste. It pleased him as well. They saw what he saw.

He stared at the matter converter. There it was. There was victory over the Baron and his plans to dominate.

Something kept him. Intuition? What? He didn't know. He was disgusted with himself. Why not snatch it up?

His communicator hummed. Impatiently, he snatched it from his pocket. It was Birdman again.

"What is it?" Ronny snapped.

"Baron Wyler," the Indian said urgently. "He's made contact with us."

"Oh." Ronny paused. The other's space yacht was considerably larger than the four-man United Planets Space Cruiser. He had no doubt that it was armed with the most efficient weapons the Baron could find.

He said, "What does he want?"

"Help."

XIV

For the moment, he didn't allow himself to dwell further on that. He snapped, "Tell the skipper to get down here and pick me up."

"Right," Phil said, and faded.

Ronny Bronston went back to the grove in which the *Pisa* had set him down such a short time before. His mind was in a whirl. He held in abeyance Birdman's information about the Baron, and tried to find

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some rhyme or reason about his own discoveries.

Wyler and Fitzjames must have been right. These people were not intelligent. Not in the sense of the word that Homo sapiens was. Intelligent, yes, he supposed. But with a different intelligence. He shook his head in exasperation.

The *Pisa* came gently to rest, and he went over to it as quickly as was safe.

The captain and Birdman were at the lock when he entered.

Ronny snapped, "What's all this . . . ?"

Phil Birdman said, "Wyler took the initiative. I suppose he picked us up as quickly as we did his yacht. At any rate, he contacted us. He says he wants help."

"Help from what?"

"He didn't say."

They went back to the control room and joined the others.

Ronny said, "It's a trap, he's trying to suck us in."

Captain Volos shook his head. "I don't think so. On the screen, he looked like a broken man. Obviously, he knows you'll place him under arrest. That all his plans are shot."

Phil Birdman said, "Listen, let's leave him in whatever juice he's stewing in. If it's a trap, we won't spring it. If he's really in trouble, it couldn't happen to a nicer guy."

Rita held a small fist to her mouth.

Ronny shook his head. "No," he said. "Let's get over there. No matter what, he's our people, and we're all in a strange land." He grunted. "A very strange land."

While the captain and his crew turned to their ship's controls, Rita looked at Ronny Bronston. She said softly, "You're not the worst person around, young fella."

Ronny chuckled wryly, "The term is *old man*, not young fella." He turned to the others and gave them a quick rundown on his meager adventures.

As could have been predicted, he earned their disbelieving stares.

Phil Birdman blurted, "Why didn't you slap one of them across the chops? That would have got a rise."

Ronny looked at him. "I didn't think of that." He paused. Then, "You wouldn't have either. Somehow, there's a no-touch feeling in the air."

"Why didn't you put the lift on one of the converters, or whatever they are?"

Ronny scowled, "I don't know. The no-touch atmosphere entered into that, too."

Takashi hissed, "There is the Phrygian ship."

They brought it into the large screen.

"No sign of a fight, or anything," Phil Birdman grunted.

The space yacht was at rest in a lovely dell. An artist couldn't have chosen a more beautiful setting to illustrate the adventure of the exploration of far planets.

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Volos looked at the Section G operatives.

Ronny took a breath and said, "All right. Set down next to them." He looked at the *Pisa*'s three junior officers, finally deciding on Richardson. He said, "If I give you a gun, do you think you can keep from shooting me with it?"

The young ensign was embarrassed. "Yes, sir. Sorry about our earlier difficulties, sir."

Ronny said, "Richardson and I will go over and case the situation. I'll keep my communicator on, and in constant touch. Anything go wrong, and you take off. Birdman will be in charge. Does Wyler know that Citizeness Daniels is aboard?"

"I talked with Uncle Max," she said worriedly. "Can't I go with you?"

"Not yet," he said apologetically. "I'm afraid you're still a hostage. I doubt if he'll attack the *Pisa* as long as you're aboard."

Rita shook her head. "He wouldn't attack it, anyway. Something terrible has happened."

"We'll see," Ronny said. "Come on, Ensign."

Takashi saw them through the lock, and closed it behind. They crossed the seemingly neatly trimmed grass to the other craft. Ronny looked it over. A luxurious highly powered yacht, probably as fast as anything UP could produce. And, obviously, well armed to boot.

He had expected to be met by well disciplined, nattily uniformed spacemen of the Phrygian space forces, but instead, Count Fitzjames was the only one at the lock to greet them.

Ronny made a brief introduction, not hiding the fact that he was holding his communicator up, somewhat as though it were a transistor radio of the type that for one or two generations had fouled up the eardrums of mankind's youth. His right hand he held ready for a quick draw.

Count Fitzjames said, the usual worry in his voice, "The Supreme Commandant is in his lounge. This way."

Baron Wyler was indeed in the lounge. He was sprawled as though exhausted in a deep chair. His eyes were wide and unseeing, and there was despair in his face.

Ronny stood before him and he looked up.

There was no more of the hail-fellow-well-met tone of voice. No friendly projection of personality, no all-embracing charm of the born leader of men.

Ronny and Ensign Richardson had seen no others on their way through the ship. It came to Ronny that whatever had happened, this was no trap. Neither Wyler nor Fitzjames were shamming. Somehow, their expedition had come a cropper.

"All right," Ronny said. "What happened? What did you mean when you radioed us for help?"

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The Baron said wearily, "I can't navigate this craft, nor can the Count. We have no way of getting back."

Ronny stared at him. "Where's your crew?"

"They've evidently been sacrificed to the gods—or something along that line. Cutting the heart out with what looked like an obsidian knife!" A spasm of horror went over the former strong man's face.

The Baron didn't seem to be particularly coherent. Ronny sat himself down and looked at the scholarly count. "Suppose you bring me up to date."

"I am not sure I can, in complete detail, but I have a theory."

"All right, take your time. Richardson, take a look through the ship."

Richardson left.

The Count said unhappily, "I am not quite sure where to start." He looked into Ronny's face. "Citizen Bronston, has it ever occurred to you that perhaps primitive man, say Cro-Magnon man, might have been more intelligent than modern man?" He hurried on before getting an answer. "Don't confuse intelligence with accumulated knowledge. You can take a man with an I.Q. of ninety and fill him with a great deal of accumulated knowledge. Keep at it long enough and you can get him a doctor's degree. On the other hand, you can take a man with an I.Q. of 150 and place him in the right—or rather the wrong—surroundings and he'll wind up with very little education at all. He'll be smart, but will possess little accumulated knowledge.

"In primitive times, if a man was slow in the head, he died. The race needed better brains and bred for them. But as we solved the problems of defense against other animals and against nature, as we learned to feed, clothe and shelter ourselves, the need became less pressing. Our less intelligent survived, and lived to breed. Finally we achieved to the point where there was an abundance of everything for all, and the need of having superior brains fell away. No longer were the most brainy in the community given the best food, the best women, the best the community could offer in all desirable things. They were no longer at a premium."

"What in Zen are you driving at?" Ronny said impatiently.

"One of my theories is that these Dawnmen are the end product of having an abundance for all for a megayear or so. They don't *need* intelligence."

Ronny took a breath. "All right, and what are some more of your theories?" Through this, the Baron was sitting, staring into emptiness again.

Fitzjames said, "If I am correct, in the Dawnworld culture the form the early industrial revolution took differed from ours on Earth. Re-

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member my using the example of the caste system in India? Well, on the first Dawnworld, wherever it was, automation didn't finally take over, conformity did. What they became was a very high industrial level, beehive type culture. The individual workers are genetically predisposed to particular kinds of endeavor, and very readily and rapidly learn that specialty . . . but can't learn anything else.

"They're a contented people, a happy people. Everybody is happy —or he's a genetic defective, and disposed of. Because he *is* a genetic defective, or he'd be happy."

Ronny was staring at him. The scholar cleared his throat and went on. "They are evidently not aggressive or warlike. But they're insect-like in the all-out-and-no-counting-the-casualties defense of their territories and their ways of doing things. They probably can't be aggressive, because they're a hundred per cent ritualistic and they have no ritual for aggression, nor for exploiting a new planet. Their expanding to new planets probably ended megayears ago.

"We were at first amazed, when we landed, that they ignored our presence. But they couldn't do anything else, because they don't have any rituals that acknowledge our existence. They haven't any rituals that take strangers, whatever their business, into account at all."

The Baron looked up. He sighed deeply and said, "Tell him, Fitzjames. I grow weary of your pedantic talk."

The count hurried on. "They do have rituals that concern treatment of criminals. Steal something from them, and you come under those rituals and your classification as *stranger* to be ignored, is superseded by the new classification *criminal* and that they do react to."

"Tell him," the Baron said petulantly.

"Their defectives are killed in a human sacrifice ceremony which must have religious aspects going back to the very dawn of their culture."

Ronny looked from one of them to the other. "You sent out your men to grab any of their devices not nailed down."

"Yes," the Baron said.

The count continued. "My theory is that the little aliens, whose planets were destroyed by changing their atmospheres, did much the same. They took a longer time. They charted a considerable number of the star systems the Dawnmen occupy. They photographed. They operated very slowly, evidently fascinated. But then they took their steps and tried to appropriate some of the devices these Dawnmen use. Perhaps they tried to trade for them, buy them, loan them, or whatever, but there was no possible way to do so. The Dawnmen are simply not interested in any contact whatsoever with any alien race. So the little aliens

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finally resorted to theft—and that was their end."

Richardson came back into the lounge. He said to Ronny, "There's nobody else aboard."

The Baron said, "We watched it all, the Count and I. The men were taken one by one to the top of the pyramid. It was an elaborate ceremony. It must go back to a period when they were on the level of the Aztecs. They cut open the chest cavity and pulled the still throbbing heart out. The Count and I watched from an altitude of about a hundred feet. There was nothing we could do. It was obvious to us that if we attempted to use weapons, they would have destroyed us in split seconds."

"Had we interfered," the Count said, "we, too, would have become criminals. As it was, we were the only ones who had not attempted theft, and hence were left alone."

The Baron ended the story. "I can operate this craft well enough to take off and land, but I am no navigator. I request that one or two of your officers be sent to help us."

Ronny opened his mouth to answer, but at that moment a new element entered into the lounge of the spacecraft.

From nowhere a voice came into the consciousness of each of them.

You are at last correct, Maximilian Wyler, you must return to the planet which our researching of your mind tells us you think of as Mother Earth. There is naught for you here.

Ronald Bronston, we detect that your motives for landing upon this . . . Dawnworld . . . were not criminal in intent, nor have you committed depredation upon us. It is our custom to send warning to stranger worlds who are potential depredators by the way of strangers who have landed among us but have committed no criminal act. You are such. However, our researching your health indicated that your life span has been so altered that perhaps it would not encompass the period required to spread the warning. Hence, we have made certain rectifications so that your span of years will equal that of a normal lifetime as we know it to be—some two and a half of what you call centuries.

Ronny Bronston sucked in air.

"Who are you?" Count Fitzjames blurted.

Researching your own mind, Felix Fitzjames, brings to our attention that in attempting to analyze our culture you compared our society to the caste system of your India. Indeed, you had elements of correctness. By why did you forget about the Brahmans among us? Why did you assume that the equivalents of the Sudras with whom you have come in contact, were the sum total of our race?

The voice addressed them as a a group again.

Go back to your Mother Earth.

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Do not be afraid of the Dawn-worlds. Felix Fitzjames was correct to this extent. We are not aggressive. We have no designs against you. So long as you have none against us, our cultures need never conflict. Farewell . . .

"Wait!" Baron Wyler blurted. "Why should I go back to Mother Earth? Why not to my own planet, Phrygia?"

You would find it difficult to breath, Maximilian Wyler. When our people are interfered with, they trace back to the planet from which the criminal element came so as to preserve themselves from additional predators in the future. The atmosphere of Phrygia is now composed of methane, ammonia and hydrogen. To the extent that Ronald Bronston succeeds in his mission of warning, a like fate will be saved your other worlds. And now we will communicate with you no longer. Farewell . . .

And suddenly there was as though an emptiness in the spaceyacht's lounge.

At long last, Ronny Bronston looked at the aging Count Fitzjames. "Are you still so sure they aren't intelligent?" he said wryly. "At least on the highest level, we can expect co-operation. Where there's logical intelligence, you can communicate."

But Felix Fitzjames, his lips pale, was shaking his head. "Is a Brahman less castebound than the lower castes? Does a queen bee have any more freedom of will than a worker?"

Ronny, and to a lesser degree Baron Wyler, were scowling at him.

The aged scholar was still shaking his head. "Perhaps the voice we just heard came from those who think of themselves as intelligent, but if it's gone through two mega-years of this culture, it must live by pure ritual, too. Because its rituals are somewhat different and more complex than the lower castes', it possibly believes it isn't a pre-programmed mechanism."

"I'm not sure I get what you're driving at," Ronny muttered.

Fitzjames was feeling it out, even as he talked. "One of the early problems of the cybernetic researchers was the fact that to be intelligent an entity must be capable of inconsistent behavior. But that means not to be logically predictable. This brings the frustration that an intelligent-inconsistent machine, which would be capable of exercising judgment, cannot be reliable in the sense of predictable. That is, the closer they come to a truly intelligent cybernetic device, the more it approaches the unreliable performance of a living organism."

The Baron shifted in his chair, as though not following. He had remained silent, in shock, since the revelation of the end of his ambition, his dream . . . his very world.

Fitzjames turned his full atten-

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tion to Ronny. "Ants are very reliable living organisms, an entomologist can predict exactly what a particular ant of a particular type will do. It's genetically pre-programmed. The voice we just heard is a part also of a genetically pre-programmed system; it must be just as reliable and therefore invariable as the lower castes. An anthill, termitarium, or beehive is a true totalitarian state—and in a true totalitarian state, the Führer, Dictator, Caesar, or whatever, is just as much controlled by the rituals and taboos as every other member of the state. This Dawnworld culture would not have been stable for such a period if its Brahmins had not been just as rigidly unintelligent as every other entity in the system."

He shook his head still once again, an element of despair in the movement. "I am afraid we can look for no hope of eventual understanding between our cultures and these supposed intelligent elements in the Dawnworlds."

The two Section G agents, Rita Daniels and Lieutenant Takashi moved from the *Pisa* to the Baron Wyler's space yacht for the trip to United Planets.

For the first few days there was little communication between them. No desire for words. There was a pervading atmosphere of mental lassitude, ennui.

It was toward the end of this period that Ronny Bronston found himself alone in the lounge with Rita Daniels. They had not been avoiding each other, it was just that they had failed to contact.

He brought her a drink from the bar and one for himself.

"What are you going to do?" he said.

She looked at him thoughtfully. "I suppose I'll stick with Uncle Max. He . . . he needs someone now."

"The last member of the team, eh?"

She looked to see if there was bitterness in his face, but it was neutral.

"I suppose so," she said. "I believe Count Fitzjames plans to offer his services to the Octagon. After all, he is the nearest thing to an authority we have on the Dawnworlds."

Ronny said, "Don't worry about your uncle. The Wylers in life make out all right. Through his power hunger, in one fell swoop he was the cause of the deaths of more people than Genghis Khan, Tamerlane, Stalin and Hitler all rolled into an unhappy one. But he'll make out."

She said lowly, "You hate my uncle, don't you?"

He shook his head at her. "I don't hate anyone. I'm rapidly coming to the conclusion that the more you learn about the workings of individuals, cultures and even the ultimate destiny of the species the

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less possible it is to hate anybody. As I recall, you were particularly interested in the ultimate destiny of the race."

"I *was*," she said wryly. "Now, I'm not so sure about it."

Aftermath

After all reports were through, Ronny Bronston came to his feet and reached in his pocket for his wallet. He tossed it to the desk of Ross Metaxa.

"My badge," he said.

Metaxa and Sid Jakes looked at him.

The Commissioner of Section G said, "What are you going to do?"

"First, I'm going to ask a girl I've met recently to marry me. Then I'm going to migrate to Shangri-la. You can turn over to United Planets the job of spreading the warning against bothering the Dawnworlds."

Sid James chuckled. "Shangri-la? What's there?"

"The hedonistic ethic."

"Eat, drink and be merry, for tomorrow we die, eh?"

"Something like that."

"Great," Metaxa growled. "But it's hardly a teaching to be followed by a whole species."

"Oh," Ronny said. "Why not? But what I do know is that the purpose of Section G is gone. The pressing need to hurry man toward his final destiny no longer appeals to me. I have seen his final destiny, and it has little appeal."

Ross Metaxa, moist of eye as always, as though from too little sleep or too much alcohol, looked at him wearily. "You haven't thought this Dawnworld threat through to its conclusion, Ronny."

His resigning agent grunted amusement. "There is no threat. We leave them alone, they leave us alone."

The Section G head grunted contempt of that opinion.

"Do you know the legal doctrine of the *attractive nuisance?* Swimming pools are classified as attractive nuisances, for instance. It's a legal doctrine based on the proposition that something like a swimming pool is a natural, inevitable attraction to small children—children who simply aren't old enough to be competent to take care of themselves, and aren't old enough, either, to be wise enough to realize they can't. Children simply can't be fenced in at all times so they can't wander into neighborhood swimming pools and drown. So the attractive nuisance laws make the owner of the swimming pool liable. It forces the pool owner to put a fence around the pool, instead of saying all the children in the neighborhood should have fences built around them.

"As I recall, the classic case that started that legislation rolling was a company in the old days that had a beautiful 75 x 125 foot concrete-lined pool on company property. One weekend, when operations

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were shut down, some kids sneaked onto the company land and dove in. The first two were in before they discovered that it was a sulfuric acid storage vat."

Ronny was getting the point.

Metaxa said, "More than one of the member planets of United Planets are in the children category. Some of them will have populations with hysterical reactions to the existence of our passive-but-appallingly-deadly-threat Dawnworlds. They'll want to provoke war. Then there'll be, inevitably, the crooks who want to steal some of those magnificent gadgets, that magnificent science. Baron Wyler was an example. There'll probably even be religious cranks who'll want to send missionaries."

Ronny said, "So we still need a Section G, to act as a fence around this attractive nuisance. Is that your point?"

Ross Metaxa growled, "You once asked me if you'd been conned into joining Section G. The answer was yes. It also would have been yes if you'd asked the question about Sid, here—or, about myself, for that matter. The job's to be done, we have to take what measures we must to do it. The question is asked, am I my brother's keeper?" He looked deeply into the other's eyes. "The answer, Ronny, is yes."

Sid Jakes chuckled. "Meaning, of course, that a keeper is one who cares for and controls the actions of one who is incompetent, irresponsible or insane."

Ronny looked at Sid Jakes. "I know of a girl you ought to get busy on, recruiting into Section G. She'll make a top agent." He slowly reached down to take up the wallet which contained his badge.

But Metaxa anticipated him, picked it up and dropped it into a desk drawer.

Ronny looked at him.

Metaxa brought forth another wallet and tossed it over. The badge inside gleamed gold at Ronny's touch.

Ross Metaxa growled, "Recruit this girl yourself, Bronston. If necessary, using whatever dirty tricks are required to rope her into our service. That's one of the prime duties of operatives of supervisor rank." ■

"Men occasionally stumble over truth,
but most of them pick themselves up and hurry off
as if nothing had happened."

SIR WINSTON CHURCHILL

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P. Schuyler Miller

the reference library

MAMMOTH HUNTING

The story in which a modern hero finds himself among a tribe of stone-age primitives, hidden away in some *cul de sac* of the modern world, dates from well before the advent of segregated science fiction. It has been put to many uses. At its simplest, it provides an excuse for a brawn versus brain confrontation, in which the author loads the dice according to his own sympathies. Edgar Rice Burroughs used that one over and over, though Tarzan is too smart to be its true exemplar.

On a pedagogical level, the writer who wants to titivate his readers with some of the newer ideas about prehistoric man can either send his hero back via time machine, or do a "documentary" with a Paleolithic hero. Jack London, in "Before Adams," was needling his readers with what he believed to be Darwin's still novel ideas on human evolution. Recently we have had William Golding's "The Inheritors."

Serious novelists, on the other hand—both in and outside of the SF circle—prefer to use the stone-ager as a distorted reflection of our own society, either to point up the simple virtues of the simple life or to show the corruption of modern man well started millennia ago. Inoculated SF writers have done the same thing for the same reason—but with a difference. The simple satirist couldn't care less whether his primitives are much like actuality: they are purely his own creation, flawed as he chooses them to be. The science-fiction author is likely to want his Neanderthalers to *be* Neanderthalers—not extras with crepe hair glued to their chests. He writes realistic fiction, not fantasy.

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Robert Nathan's "The Mallot Diaries" (Alfred A. Knopf, New York; 1965; 174 pp.; $3.95) illustrates the difference rather well. Nathan is a poet and writer of fantasy—gentle, sentimental, beautifully woven—who rarely solidifies his work enough for it to be considered as borderline science fiction. "The Weans," in 1960, was his rather heavily satirical last. This time he gives us a handful of Neanderthal survivors in—of all places!—Arizona, coming to grief under the same social pressures that are making us squirm.

He had constructed his primitives out of an extraordinary hodgepodge of ideas and suggestions, culled from scores of archaeological and anthropological sources. Any anthropologist would scream in pain at the suggestion that this collage portrays Neanderthalers—even American Neanderthalers of the present, who buy root beer and jelly beans with gold pieces looted from a wagon train by their ancestors. But with a little thought he can probably identify the sources of the bits that Robert Nathan has so deftly assembled to portray *his* People of the Bear. They bear the same relation to reality that some of the early reconstructions of dinosaurs did, built up out of misfitted bones.

His anthropologist narrators do visit the People of the Bear, learn a little about them, and are present during a revolt of the children and teen-agers, which bears a by-no-means coincidental relation to the juvenile rebellion of our own society. But gently and subtly he shows us more than the obvious about ourselves.

In any standard SF yarn of a visit to a Neanderthal tribe, a mammoth hunt is essential—the big set-piece. Depending on whether the author's forte is action or mammalogy, the emphasis will be on the carnage or the animals. But it will be realistic.

A mammoth hunt is also a climactic moment in "The Mallot Diaries"—but with a difference. We know there are no mammoths left in Arizona—but so do we know there are not and never were any Neanderthal men to hunt them. The hunters are drugged with fermented honey and hallucinogenic mushrooms. Whether the mammoths they find, the mammoths they kill triumphantly to demonstrate their manhood, are real or the result of a witch-doctor's post-hypnotic suggestion, or their own autosuggestion, is left for the reader to guess. As Alma, the almost-beautiful almost-heroine says gently:

"Everyone kills his own mammoth."

In the best science fiction, the reader is also allowed to kill his own mammoths. The author may drug him and prepare him for the hunt, but he must be allowed to hunt for himself. What he finds, and what he brings back from the hunt, only he can know.

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TO WORLDS BEYOND

By Robert Silverberg • Chilton Books • Philadelphia • 1965 • 170 pp. $3.95

If you look at this collection as part of the Chilton line of science fiction for juveniles it makes better sense. Robert Silverberg has had much better stories in paperbacks, so why should this minor one get deluxe treatment? Simply because good juvenile SF goes into school and public libraries, and is bought by doting aunts, and has to be hardbound.

From this point of view, the book becomes more than just a collection of fair stories. They have been selected to illustrate the variety of science fiction to inexperienced readers—both variety of plot and variety of theme. They are good examples of the "plot as hero" type of story, and Bob Silverberg has prefaced each one with a special introduction that reinforces the theme painlessly.

Two of the stories, and not the best, first appeared here in Astounding: "Mind for Business" in 1956 and "Certainty" in 1959. The first is a rather gaggy puzzle: when protean aliens are masquerading as a human rescue force, how do you tell the Good Guys from the Bad Guys? "Certainty" suggests that we just might come up against someone smarter than we; being Earthmen doesn't make us automatic winners.

"The Old Man," with a snapper ending, is intended to jolt kids with the idea that in space you're old at twenty. "New Men for Mars" is one of the best in the collection: confrontation of two theories of colonizing Mars—making the planet over to fit our limitations, or selecting men who can live on the planet's own terms. "Misfit," showing the other side of the coin, points out that the adaptability of ordinary unspecialized human beings can sometimes be as valuable for survival as specialization.

"Double Dare" is a story whose plot hangs on a gimmicky twist, but which also has a valid lesson buried in it. Are Earthmen innately smarter than Domerangi—or vice versa? A tricky competition emphasizes that different races and cultures advance in different *ways*, more often than along some "absolute" scale of accomplishment. "Collecting Team" is more openly a gimmick yarn: the puzzle of a very strange planet is neatly solved by the realization that it's a zoo.

Finally, "The Overlord's Thumb" could launch a hot, timely discussion in many a high-school class—or in adult circles, for that matter. When a man in our overseas military bases, or in the Peace Corps, is an offender against local customs and religion, can he claim a kind of diplomatic immunity as an "overlord" from a superior society, or should he be answerable to indigenous law. This is a very real issue right now, all over the world. Bob

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takes the emotion out by transplanting the question to a retarded planet and opens it up for thought and discussion.

Teachers take note. . . .

SPACE LORDS

By Cordwainer Smith • Pyramid Books, New York • No. R-1183 • 1965 • 206 pp. • 50¢

"Cordwainer Smith" is the pen name of a man who is distinguished in many other fields, now teaching in Australia. In a recent appreciation in *Amazing Stories,* Robert Silverberg has suggested that he is really a time traveller—a visitor from that universe some fifteen thousand years in our future about which he writes. In his stories, he lets us glimpse it as a guide will show you a mountain, from ever-shifting vantage points. We share its adventure and its romance, its horror and its beauty, its legends and its history. There is no stranger future in science fiction, unless it is some of the worlds of J. G. Ballard, and Ballard's most convincing worlds are nightmares while Smith's are deceptively everyday. They epitomize J. R. R. Tolkien's concept of the Secondary World, which I have described elsewhere in this department: you never step outside.

The five stories in this collection show us the worlds of the Instrumentality at five different places and times. Some of the same people are in more than one of them; the same science and the same galactic and intergalactic society are the warp on which bits of the great pattern are woven.

"Mother Hitton's Littul Kittons" is the story of a thief's attempt to penetrate Norstrilia's secret outer defenses—horrible defenses—to steal immortality. The author calls it a version of the Ali Baba story; it is also the story of Prometheus.

The longest and best story of the five is "The Dead Lady of Clown Town." This is a key to the understanding of the underpeople, the beasts made men like the tragic creatures of Wells' "Island of Dr. Moreau," yet more tragic because they are more human. It is the story of the dog girl, D'joan, of the misplaced witch, Elaine, born on Manhome itself, of the Lady Panc Ashash, dead for centuries yet speaking from a robot body, and of what they did to the Instrumentality and its lords.

"Drunkboat" gives us a glimpse of the structure of the universe in a distorted, nightmarish love story. For he, the story itself never lures me inside: I can't believe that Artyr Rambo's love is great enough to drag him through Space Three. I stand outside and examine the vistas shown me, but don't participate.

"The Ballad of Lost C'mell" is almost a vignette, though it covers years and gives us a precis of a man's life: Lord Jestecost and his determination to make D'joan's martyrdom of long before of sig-

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nificance. The C'mell I remember is the one I met in "Alpha Ralpha Boulevard."

Finally, "A Planet Named Shayol" takes us to the penal world of the Instrumentality, terrible yet a boon to Mankind, the secret focus of bureaucratic and oligarchic corruption and the hopelessness of the terribly huge.

Once men believed the Earth—Manhome—was like this. The universe is.

WORLD'S BEST SCIENCE FICTION: 1965

Edited by Donald A. Wollheim and Terry Carr • Ace Books • New York • No. G-551 • 1965 • 288 pp. 50¢

It is safe to call this anthology a history-making bargain. The seventeen stories may not be the best published in 1964—it's too early to say whether the editors' personal preferences, the publisher's policies, or prior selection for other books set the style of the collection—but it certainly covers the science-fiction-writing world. Contributions from Czechoslovakia (Dr. Josef Nesvadba's needling yarn about vampire automobiles, "Vampires Ltd."), the Netherlands (Harry Mulisch's rather old-fashioned "What Happened to Sergeant Mulisch?"), and Australia (Colin Free's grim little story of monotonous utopia, "The Weather in the Underworld") accompany stories by more familiar British and American writers.

Donald Wollheim, Ace's SF mentor, was an expert on science fiction before the term had been invented: I'm not sure he didn't invent it. Terry Carr, his new assistant, is one of the most vigorous representatives of recently current SF fandom. They have taken on an ambitious job, and although their first selections are less individual than Judith Merril's and contain fewer highlights than Groff Conklin's best anthologies, the general level of the book is probably a notch higher than the general level of whatever magazine you fancy.

Analog is, incidentally, represented by two very different stories. Christopher Anvil's "Bill for Delivery" is a trivial comedy of contrived error that seems to have been preserved from the days of *Thrilling Wonder Stories*. William F. Temple's "A Niche in Time," on the other hand, draws a classic portrait of a familiar type, the professional academic scholar, who employs time travel to tidy up the past and makes his own mark on time in a disappointing way.

Seventeen stories are too many to describe with the space we have. I particularly like Dr. Nesvadba's savage yarn; Temple's; Tom Purdom's cruel vision of a society controlled and crippled by marketing psychology, "Greenplace;" Norman Kagan's "Four Brands of Impossible," which projects today's college world not too far ahead; Edward Jesby's strange picture of vigor and deca-

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dence in the future, "Sea Wrack;" and Fritz Leiber's bit of Martian poetry, "When the Change Winds Blow." Thomas M. Disch's "Now Is Forever" is a hard-to-forget vision of where we're going, and John Brunner's "The Last Lonely Man" portrays a pitiably repulsive type of psychological vampire. The rest strike me as run-of-the-mill: some superficially clever, some tired variants on old formulas.

But I'll bet that as these annual anthologies develop, and especially as the editors contact more sources in Europe and elsewhere in the world, they'll be better and better.

TERMINAL BEACH

By J. G. Ballard • Berkley Books • New York • No. F-928 • 1964 • 160 pp. • 50¢

J. B. Ballard is, for my money, the most outstanding of the new English science-fiction writers who have almost created a new school of SF across the Atlantic in the last decade. In some respects, and in some moods, you could call him an English Cordwainer Smith. The nine stories in this collection span his abilities well.

"End Game," which opens the book, need hardly be projected ahead. It is Ballard as Kafka, probing the minds of condemned and condemner somewhere just over a foreign frontier. "The Subliminal Man" is about as ordinary as Ballard ever becomes: modern man feebly struggling against the compulsions of our consumer society. "The Last World of Mr. Goddard" is surely fantasy—an old man who has his little world in a box.

"The Time-Tombs" is one of Ballard's evocations of utter strangeness blended somehow with familiarity, in its deftly suggested etching of a Mars as delicately beautiful as anything Bradbury ever suggested, and far more hauntingly real. "Now Wakes the Sea" has been anthologized before: call it madness made real, call it magic, call it what you will that brings a Cretaceous sea rolling into an English village to consume the man it wakes and haunts.

"The Venus Hunters" is another strange one. It introduces and brings into solid life a man who has talked with saucerians from Venus, a man who could be the late George Adamski and moved by very similar forces. I'd call it by far the best serious flying saucer story I've read. "Minus One" is a black farce of bureaucracy making itself secure. "The Sudden Afternoon" is an old-fashioned nightmare that used to be standard fare in *Weird Tales*: the magician who moves into my body. And the title story, closing the book, is a nightmare of Eniwetok and the nuclear bomb tests.

These days, it seems, there are no bad Ballard stories, just as there are no bad Cordwainer Smith stories. The worst are merely ordinary by current standards, and there are fewer of them every day.

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brass tacks brass tack

Dear Sir:

Your editorial "How Little We Know" is probably in some ways conservative, because for the most part we don't know a damn thing. However, *hindsight* being what it is, your tirade didn't carry its usual impact of socio-scientific criticism, except perhaps for the inset on Krebiozen. Interdisciplinary information and its dissemination has just barely come into its own. Hence, the tidbit about Xenon being an anesthetic was very interesting, but aside from the new-found ability of these so-called inert gases to form *clathrates* in solutions—which might explain this phenomenon in physico-chemical terms, it may be said that discoveries and their understanding and application usually are years apart.

I might add that these clathrates are a loose association of the dissolved gases with water molecules. A hydrate in solution, as it were. But, one might ask, why only water, why not other solvent molecules? Why not, indeed. The rather high solubility of Xenon may be a clue, now that we think about it. If my memory serves me correctly —lacking a handbook—Xenon is some five times more soluble in water than either oxygen or nitrogen, and solubilities are quixotic in the presence of other dissolved components, increasing or diminishing several orders of magnitude. It wouldn't surprise me a bit if it was found that the oceans are vast reservoirs of these inert gases, for the flimsy reason that no one had previously bothered to investigate. Is the "raptures of the deep" really nitrogen narcosis or is some other heretofore unrecognized element affecting the nervous system? We don't know a thing from all appearances, but we're catching on rather rapidly. And mainly it's all in how one looks at a problem.

A Los Angeles air pollution investigator once remarked to me that air enriched with oxygen to 75-80% concentration was beneficial, but 100% could prove fatal and just trace amounts invariably is. I had to think about that one for a moment. More recently I read an

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author's plea for the adoption of his plan to make the temperature scale logarithmic in the cryogenic region. In the temperature range below 20°K interesting things begin to happen. Below 1°K a lot of metals become superconductive, and under 0.1°K where investigations are rapidly developing, lies a zone of unfathomed mystery. It seems appropriate to characterize these low-low temperatures with a more workable system. In my own experience "vacuum" has been characterized obliquely by units of pressure, millimeters of Mercury (Torr). This needs revamping very badly as lower and lower pressures are achieved. A long time ago some chemical genius decided that acidic and basic solutions needed a more convenient nomenclature to express one of their parameters and used the negative log of the hydrogen ion concentration, or as we know it: pH. Similarly, the negative log of pressure units, say 10^{-10} mm of Hg, could be expressed as 10 pTorr, and the greater the vacuum the larger the number. (Temperatures under 10°K, and particularly under 1°K, could be treated the same way.)

On the other hand when we speak of a vacuum we talk in terms of pressure. In one sense this is almost as bad as our being the last country to convert to the metric system—whenever that happens. Vacuum could be expressed also as the root- mean-square of the number of molecular collisions per cubic micron, or even as the mean free path of a molecule before collision with another. There are many ways to look at a thing; but, convention is a very viscous medium, and fresh viewpoints tend to be immiscible for that reason. Coneybear's First Law, no doubt.

Personally, I would like to see a "How Little We Know" series, pointing up our foibles, with a few well-garnered suggestions on how to circumvent or surmount them. As a case in point, if you haven't already read them, a series entitled "The Case for Going to the Moon," by Neil C. Ruzic, editor of *Industrial Research* (VII parts: September 1964 to March 1965), presents a powerful argument for *thinking in other categories.*

Ignorance is bliss, because we have so many fascinating things to learn.

Frederic Jueneman
3814 Willowood Drive,
San Jose, California 95118

Those logarithmic scales would make sense! Only pTorr would be symbolized pT, and confused with PT relationships.

Dear John:

Just received my copy of the September Analog. Notice that you wonder how many readers can name H. Beam Piper's first story in ASF and date it. Well, here's my entry: "Time And Time Again" April 1947. I keep an index card

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file of all magazines in the SF-F field both by title and by author.

Stuart S. Hoffman
Box 13
Black Earth, Wisconsin

First—and sadly, the last appeared in our November 1965 issue.

Dear John:

Subjective "experiments" have been in use for years. However, they were—and are—subjective experiments with subjective results. What *you* want is a subjective experiment with objective results. These are not so obvious. But they are just as common.

Take the example of a woman with a psychosomatic illness. It really *is* all in her mind; but this does not prevent her arm from being-actually-totally paralyzed even to the point where her reflexes will not function. Hold a match to her fingertip and you succeed in merely burning her finger. Her arm doesn't jerk back. It can't, it's paralyzed! Or even more objective, symptoms where a man, who believes he has been exposed to a fatal disease, comes down with all the symptoms of that disease, minus the ones he didn't know about. And yet he's not faking. His skin really does break out in hives and his temperature may rise sharply.

Now for our part of the experiment. We prescribe for each of these patients capsules which they believe to contain foolproof wonder drugs for their illnesses. Immediately we note a drastic improvement.

Is this not a subjective experiment—for them—with an objective result—for all to see?

Reference your editorial of March 1963, which I just got around to reading.

KENNETH VARLEY
719 Stones Crossing Road
Easton, Pennsylvania 18042

That form of objective-subjective experiment has indeed been around a long time. Any hypnotist with a good subject can demonstrate those phenomena readily—because the human organism is a subjective-to-objective transducer device.

What I'm asking is that some work—some real research and thinking—be done on finding out how a subjective-to-objective and objective-to-subjective transducer operates!

A good hypnotic subject can be made to turn off his subjective-to-objective transducer, so that he can't move his arm if he wants to; then if you burn his finger, he'll feel pain, and cry out, but won't be able to withdraw his hand.

Or he can be induced to turn off his objective-to-subjective transducer; then you can burn his hand —do objective damage to the tissue —but he will feel no pain.

As one friend of mine put it, "I know telepathy and telekinesis are real—I can read my own mind, and by merely wishing it, I can move my own body. But I dont know how those things work. Sure there are

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nerves—but how does a wish cause objective biochemical transformations in those physical nerve cells?"

Dear Mr. Campbell:

CONGRATULATIONS! Analog/Astounding has scooped Mariner IV on the subject of Martian craters, as follows:

1. Back in 1961-1962—My memory is faulty and my 1950-1965 magazine file is eighty miles away—your cover artist depicted a submarine-spacecraft—a hydrospace aerospace marriage, if I had ever seen one—hovering over Mare Sirenum.* The Mare had a king-size crater as one of its key tourist attractions. This crater is only 1,000 km. away from the 120 km. crater of Mariner IV shot No. 1, which has been rightfully nominated as the most important scientific photograph of the Twentieth Century.

2. Then, in May 1963 issue, you published G. W. Harper's "Observational Difficulties." Harper predicted that Mars would be liberally sprinkled with craters.

Therefore, I nominate the editor, cover artist, and feature writer for appropriate recognition, in the form of Mariner IV photo No. 11 autographed by Dr. Leighton and coworkers, and presented by the Jet Propulsion Laboratory's Mariner team.

VICTOR KACHUR
1257 Loyal Drive
Clairton, Pennsylvania 15025

**It was June 1960.*

Dear Mr. Campbell:

The following is a possible candidate for the "This is English?" Department on page 41 of the November, '64 issue of Analog. To paraphrase the text, it is a sentence proposed by George Orwell to translate a passage of the Bible as some writers might interpret it. (From: *Modern English Handbook,* by Gorrell and Laird, Prentice-Hall, page 421.)

> Objective consideration of contemporary phenomena compels the conclusion that success or failure in competitive activities exhibits no tendency to be commensurate with innate capacity, but that a considerable element of the unpredictable must invariably be taken into account.

Although Orwell is merely establishing a point, there are those who write for a few magazines I can think of whose abstractness is nearly commensurate with Orwell's hypothetical case.

WILLIAM A. LEWIS, JR.
Box 24
Bunola, Pa. 15020

Darned if I can recognize the Biblical passage from that "translation!"

Dear Mr. Campbell:

Anyone who has dreamed of going to the stars is usually very disillusioned upon reading any good book about relativity. The major block to any hopes of reaching or exceeding the speed of light is a theoretical notion called mass dila-

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tation. Undoubtedly you are familiar with this problem. I am a high school student and am by no means an expert on relativity, but I believe I have found a solution to the above problem.

Consider a spaceship driven by some sort of atomic drive. Let it so be defined that the driving force will equal:

$$mc^2$$

Where m equals to the fissioned mass per unit time. While the spaceship is stopped relative to the Earth, we may use the classical Newtonian equation:

$$F = Ma$$

Since: $F = mc^2$

Then: $mc^2 = Ma$

From the Special Theory of Relativity we know that:

$$m = \frac{m_o}{\sqrt{1 - \frac{v^2}{c^2}}}$$

Where: m = mass of moving object
m_o = rest mass
v = velocity

Hence when the ship begins to accelerate, all mass in the ship will be described by the matter in motion equation:

$$\frac{m_o c^2}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{M_o a}{\sqrt{1 - \frac{v^2}{c^2}}}$$

As you can see, the denominators will drop out on both sides of the equation and leave a form identical to the form of the equation when the ship was at rest.

The reason for this odd thing to happen is the fact that while the mass of the ship is increasing, the mass of the fissionable material is proportionally increasing. Hence the relation will remain the same as if the ship were not moving at all.

One might wonder why a subatomic particle can not be accelerated to the speed of light. In the case of our spaceship, the source of acceleration was moving along with the ship. In the case of an accelerated subatomic particle, the source of acceleration is stationary relative to the particle. Hence both the particle and the accelerating energy will *not* increase proportionately.

I hope you find this concept as interesting as I found it.

Russell E. Adams, Jr.
3212 Norfolk Street,
Pompano Beach, Florida

The fuel gets hyper-massive, too!

Dear Mr. Campbell:

I do not disagree with your opinion that there is much we do not know ("How Little We Know," September 1965) but I do wish to comment on one of the examples you used to illustrate this—namely, the rotation of Mercury. Your explanation involves the "Solar Wind"; in a recently published article, however—S. J. Peale and T. Gold, *Nature 206*, 1240-1241 (June 19, 1965)—a different proposal is advanced.

Writing in *Nature*, Peale and Gold point out that the eighty-eight-

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day synchronous rotation would be expected if Mercury had a circular orbit, but since Mercury has a rather eccentric orbit, then as a result of the solar torque—acting on the tidal bulge to retard Mercury's rotation—being inversely proportional to the sixth power of the distance between Mercury and the Sun, Mercury's rotation would be determined to a great extent by its orbital angular velocity at perihelion, not by its average angular velocity.

I hate to say this, but your idea of using the "Solar Wind" may be nothing but a lot of *hot air.*

JOHN H. GLASER

Millside Manor
Riverside, New Jersey 08075

So—it's still how little we know!

Dear John,

I register a small growl at the letter by G. Harry Stine in the October issue criticizing my "Glimpses of the Moon" as being based on an incorrect premise. (You will recall that, like you, I spend much time growling at people who "know" things that aren't so.)

With all respect to Robert A. Heinlein's great story, "The Man Who Sold the Moon," I must point out that I am a lawyer.

Neither English Common Law nor International Law says that a landowner is entitled to "a wedge of Terra down to the planetary core and upwards to infinity", as Mr. Stine puts it. In many countries landlords don't even hold mineral rights to their properties; the government owns those.

The accepted phrase—and legal minds are touchy about phraseology—goes back to Grotius, the father of International Law. It says a *nation* can *claim* ownership "from the center of the earth to the heavens above."

In other words, as things stand right now the Soviets can lay a perfectly legal claim to a *pyramid*—not a wedge or column but a pyramid—with its apex at the Earth's core and its *surface* boundaries marked by the east, west, north and *south* borders of the U.S.S.R. The United States and other nations can do likewise. Who has ownership where the pyramids intersect out in space has never been adjudicated.

So you see that the moon's orbit through the plane of the ecliptic has "nothing to do with the case." A nation that gets its ship to the moon "fustest with the mostest" has a solid claim to it, *but only while the satellite is above that nation's horizon*, if the claim is challenged by a country on the other side of the Earth.

Would that generalization apply to tiny Iceland, the apex of whose space pyramid would have a very acute angle? My geometry isn't up to answering that.

No wonder the World Court's in a *real* tizzy over the problem.

WALLACE WEST

"Twinkle Twinkle little star
How I wonder whose you are!"

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KUDOS FOR NASA

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learned only by the hard, frustrating, ulcer-generating method of trying and trying and learning from failures.

It doesn't depend on engineering rule books, either; it usually comes down to the skill certain particular men have acquired.

An example of that sort of problem came up during WWII with respect to microwave radar equipment. The receiver for the returning echoes was a superhetrodyne type circuit, and in those days—before masers—they had no device that could amplify 10,000 megacycle radio frequency energy satisfactorily. Therefore, they needed a local oscillator tube that was efficient and quiet.

A tube was developed by the Bell Labs and Western Electric engineers, working in collaboration; it looked like a perfectly ordinary metal receiver tube, save that it had a peculiar sort of yoke on one side, and one of the eight base pins was a couple of inches long. The yoke gadget was the tuning arrangement; tighten the yoke and the cavity resonator inside was squeezed to a slightly different configuration, and hence a slightly different frequency. The tube produced about 20 milliwatts of 10,000 megacycle energy, and did the job beautifully.

The British wanted to produce similar tubes for their own use, so complete engineering specifications of the little klystron were sent over, together with some of the Western Electric engineers to help the British manufacturers get started.

Meanwhile, the Germans had got hold of one of the microwave radar units—it was called, by them, the "Rotterdam radar," because that's where the plane carrying one was shot down—and had gone to work duplicating the system.

At the end of the war, the Germans had not succeeded in making a 10,000 megacycle tube that would serve as a local oscillator; the best they could get out of their best effort at duplicating that Western Electric tube was two milliwatts.

After several months of frustration, the British engineers decided that copying the Western Electric tube was hopeless. They hadn't been able to duplicate it, even with complete specs and the help of the WE engineers who'd been manufacturing it in the U.S.!

So they scrapped the project of duplicating the U.S. tube, and developed their own. Theirs worked fine—just as effective a local oscillator as the WE tube, but developed completely independently.

Engineering know-how is not a science—it's an art. Like any other art, it helps to have someone who already has mastered the art show you how he does it—but that doesn't mean you then know how to do

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it. You still have to start from scratch and learn the art in your own personal style.

The Jet Propulsion Laboratories team has, quite evidently, learned the high art of interplanetary probe technology. Their scientific calculation of component reliability, number of critical components, all the factors involved in achieving success, showed that there was only a seventeen per cent chance of getting pictures back from Mars.

That was the scientific answer. One hundred per cent success was the answer of the Engineering Art.

The results Mariner IV sent back definitely belong in the "How Little We Know" department; it definitely showed that we have a great deal to unlearn in our theories.

When the first picture came through and was processed, the JPL people said that the camera had, apparently, developed a fogging effect, as indicated by the cloudy appearance of the black sky near the edge of Mars. They assured the reporters—and the TV audience—that they couldn't really be clouds, because Mars' atmosphere was too thin to support clouds at that elevation.

So . . . it turned out that Mariner IV was working better than their theories; they *were* clouds.

After all twenty-one-and-a-fraction pictures came through and were given a preliminary study, the JPL people were able to say that Mars much more closely resembled the Moon than the Earth—that its surface was pocked with tens of thousands of craters.

The mix-up seems to have resulted from failure to consider what happens in a near-vacuum atmosphere—only about one per cent of Earth's—under the day-night temperature changes.

The temperature changes are not quite as extreme as those on the airless Moon—but they're vicious.

Moreover, dust on Mars is not consolidated into a sort of crisp foam material by the vacuum-contact welding of totally degassed materials. Neither is it cemented together by rainfall, and the powerful solvent properties of water. Consider what would happen to some fine-ground plaster of paris left out on the surface of the Moon, on Mars, and on Earth. On the Moon, it would very quickly consolidate by hard-vacuum degassing, and contact welding. On Earth, the first rain or even dew-fall, would cause the $2CaSO_4 \cdot H_2O$ to dissolve, and reprecipitate as the less soluble gypsum, $CaSO_4 \cdot 2H_2O$. But on Mars, there's enough gas to prevent vacuum welding, but not enough water to cause the solution-recrystallization effects that consolidate dusts on Earth.

When Krakatoa blew its top some years back, it blasted rock-flour into the upper stratosphere—where it remained for a decade or so.

Mars has winds of hurricane vio-

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lence, so far as velocity is concerned —but of low force, because of the extremely low density. But those winds, acting on unconsolidated dusts from innumerable astrobleme craters, can carry them to immense altitudes, as the fine dusts from Krakatoa were carried in the upper Earth's atmosphere.

In effect, when Mariner IV showed them clear, sharp pictures of immensely high dust clouds on Mars, the JPL scientists didn't believe their own interplanetary eye!

Now this dust raises a fascinating problem that the NASA people are *not* going to enjoy. The Moon close-ups that the later Ranger series sent back to us gave evidence that if the Moon has much dust, it's not very deep, and crusty rather than dusty.

But Mars is like the Moon in having a surface consisting largely of astroblemes—tens of thousands of craters. The marks left on a planetary surface by the impact of meteors ranging from one hundred feet in diameter to, probably, a hundred miles or more in diameter. Close to the asteroid belt as Mars is, it may well have collected some 100-mile-diameter planetoids.

When a big one comes in, it produces rock-flour. It also converts large quantities of itself and the local rock into plasma hot enough to radiate in the X-ray region. The pressures and temperatures produced approach the thermonuclear levels for a few microseconds. Gaseous nickle-iron and rock, spurting out from the impact crater, condense to impalpably fine dust.

And in Mars' atmosphere—*they'd stay that way.*

No vacuum-contact welding to consolidate them—no water to cause solution-recrystallization consolidation. And thin, screaming winds driven by extreme temperature differences to sweep that impalpably fine dust around.

Old craters wouldn't be weathered away; they'd be filled with drifted dust so fine as to be fluid—a fluid dust perhaps miles deep.

Wouldn't that be a lovely place to set down a space vehicle? Even exploratory instrumented probes could go into that and be sunk without a trace—or any signal escaping.

And if you did set down an instrumented probe in some wind-swept, dust-free spot . . . how long before it would be buried by some shift of wind-pattern, winding up under a half-mile deep dust-dune?

Mars may prove a more deadly mantrap than our Moon.

In the last couple of years, Analog has become a sort of unofficial Journal of the Meteoritics Society —Dr. Ralph Hall's recent articles on meteoritics introduced at least two new concepts into the science. He was the first to point out that an incoming major meteor radiated X rays, and to do serious study of the phenomenon of secondary meteors.

The whole science of meteoritics

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has developed, really, only during the last decade. Dr. Robert Dietz invented the term "astrobleme," and developed the geological evidence that can demonstrate that a particular formation in the Earth is a meteor crater. The Barringers showed that the Arizona crater is in fact a meteor crater only in this century. The whole study is quite new.

In the May, 1963 issue of Analog, George W. Harper, in his article "Observational Difficulties" showed that our observations of Mars by Earth-based telescopes can never be much more adequate than naked-eye observations of the Moon—that only by going to Mars, or sending probes that return pictures, can we find out what the surface of the planet is like. But going on the basis of the position of Mars in the Solar System, and the characteristics of the System, he showed that Mars was, in all probability, as heavily crater-marked as the Moon.

Mariner IV was not only a picture-machine; it also measured a lot of other things. By studying the way Mars' atmosphere affected the radio transmissions from Mariner as the probe went "behind" Mars as seen from Earth, far more precise measurements of the density of Mars' atmosphere were made possible. Mars' surface atmosphere approximately equals Earth's at about 100,000 feet. It can't be used for parachute landings, though it could be used to dissipate the major part of the kinetic energy of a landing probe or manned capsule, since even 100,000 foot atmosphere can produce terrific friction drag on mile-per-second and faster capsules.

Also Mars has no magnetic field.

Clearly, Earth is a far more nearly unique individual than science has, hitherto, recognized. It's the old problem, "I know what human beings are like; I'm one myself." If all men were identical, with identical heredity and identical life-experiences, that would be valid. And if all planets were identical in size, and formative history, then Earth would be typical of other planets.

Venus, thanks to Mariner II, we know has no appreciable magnetic field. It rotates very slowly indeed, although it's almost the same size as Earth. Mars has no magnetic field, and rotates at about the same rate as the Earth. Jupiter is known to have a terrific magnetic field—it has Van Allen belts of monstrous magnitude, so extensive and intensive that even at almost half a billion miles they could be detected by radio phenomena. The Moon, which rotates slowly and is much smaller than Earth, about half the size of Mars, has no appreciable magnetic field.

If a planet's magnetism is due to its rotation and a metallic core—Earth appears to have both—then Jupiter's field would be expected to be very powerful. Jupiter rotates in less than ten hours, and has an immense core.

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But—why hasn't Venus? Why hasn't Mars?

The Moon, they now find, far from having a metallic core, seems to have something closer to a metallic *shell!* The density of the Moon's outer laters is *greater* than its interior!

All existent theories of planetary formation are in for some very serious shocks and major revisions.

Perhaps magnetism does not result from a metallic core but from a "collapsed matter" core, a core of extremely dense material resulting from the fact that the immense pressures have collapsed the atoms into a hyperdense state. Calculations have indicated the Earth's core pressures are slightly above the level required to collapse the outer electron rings of most atoms, while Venus' internal pressure is just slightly below the collapsed-matter intensity. Jupiter, of course, must have an immense core of collapsed matter; its internal pressures are stupendous.

That conversion of rocky matter to a collapsed state would explain why Earth has such an anomalously high density. All the other minor planets and the major Moons whose densities are known have densities in the rocky material range—say between 2 and 4.* Earth's density is 5.5, and the giant planets, of course, have low densities because what we measure as the diameter of Jupiter, Saturn and the others is the diameter of their immense gaseous envelopes. Saturn's density is well below that of water.

Another factor that may be extremely important in considering Earth as a "typical" planet is the question of radioactive heat generation vs. rate of heat conduction through planetary masses.

When I went to school, the radioactive atoms were the atoms of the super-heavy elements, uranium and thorium, and the disintegration products of those elements—radon, radium, et cetera. All the radioactivity in the Earth was due to those.

Since then, we've learned a bit more about radioactivity. Potassium-40 is the lighest known long-lived radioactive isotope; it has a half-life of 1.3 billion years. (Beryllium-10 has a respectable half-life, however—2.7 million years. But all million-year isotopes were exhausted long before life got organized on Earth.) Calcium-48 represents 18% of natural calcium, and has a half-life of 20 million billion years; it's not really excessively unstable. (It emits a 120,000 volt electron.)

But let's put the multi-gigayear

*The densities of Mercury and Venus are not known with any accuracy. Since density is mass divided by volume, if either mass or volume is inaccurately known, density is very inaccurate. The diameter of Mercury can be measured only approximately, because of extremely bad observing conditions. Even radar has troubles; Mercury is distant, small, and always close to the Sun, which puts out a fantastic hash of radio-frequency energy. Neither Venus nor Mercury has a moon; their masses can be determined only by their effects on the orbits of other planets—which leads to inaccurate mass values. Published densities of Mercury range from 3.2 to 5.2; Venus' seems to be somewhere between 4.0 and 5.5

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half-life radioactives in tabular form (see table below):

The energy contribution of calcium-48 does not amount to much; it's a low-energy breakdown, and since the estimated age of the Solar System is about 5 billion years, during the expected lifetime of the Universe, Ca-48 won't have time to yield much of its energy at that 20 million billion year half-life rate. The contribution of that million-billion-year platinum isotope isn't going to be overwhelming, either—particularly in view of the non-overwhelming quantities of platinum around. Samarium, despite its extremely long half-life, does yield appreciable energy in a planet, simply because the so-called "rare earths" aren't so rare as they used to think, and because of the relatively high energy yield per atom. It's an alpha-emitter, incidentally, as are almost all the long-half-life, high-energy radioactives. The contribution of lead-204 can be forgotten; in ten billion billion years

Element	Isotope	Half-life in billions of years	Energy in MEV	% Naturally occurring element
Potassium	40	1.3	~1.4	.0118
Calcium	48	20,000,000	.12	.18
Vanadium	50	600,000	.71 & 1.6	.24
Rubidium	87	47	.27	28
Lanthanum	138	110	~1.5	.09
Cerium	142	5,000,000	1.5	11
Neodymium	144	5,000,000	1.4	23.9
Samarium	147	10	2.2	15
Samarium	148	1,200	2.14	11.2
Samarium	149	40,000	1.84	14
Gadolinium	152	11,000	2.7	.2
Lutetium	176	21	1.0	2.6
Hafnium	174	4,300,000	2.5	.18
Rhenium	187	70	.01	63
Platinum	190	700	3.1	.013
Platinum	192	~1,000,000	~2.6	.78
Lead	204	10^{19} years	2.6	1.5
Thorium	232	14	4.0	100
Uranium	238	4.5	4.5 & ~200—spontaneous fission.	99.27

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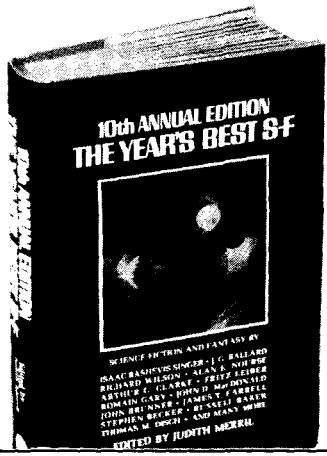
only 2.4 MEV! Rhenium's 70 billion year half-life isn't too extreme —but rhenium is a *really* rare element—and makes platinum look as common as copper.

The important energy contributors are potassium-40, rubidium-87, thorium-232 and its daughters, and uranium and its daughters. Both thorium and uranium are relatively abundant elements, and each gives off not only the listed 4 to 4.5 MEV radiation, but its shorter-lived daughters then proceed to spit out bits and pieces for a few gigayears more before winding up as lead, or bismuth. (Bismuth-209 is the heaviest of all stable isotopes, with lead-208 next.)

Now the rate of internal energy generation and the surface area through which that energy can escape into space is the critical factor in determining the internal temperature of a body in space. It's been pointed out that a human being, due to normal metabolism, generates more heat per pound of mass than the Sun—or than, even, an exploding nova!

A big, stony mass is going to generate heat internally by reason of radioactivity; a mass the size of Earth can generate an enormous amount, even with such slow heat-sources as the natural radioactives. Since rock is an extremely poor conductor of heat, the rate of heat generation in thousands-of-miles thick masses may be higher than the rate at which the heat can be



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conducted out to the cool surface—in which case some other heat-transfer mechanism is bound to come into play. If conduction can't handle the load, then radiation and/or convection must set in. Radiation can't penetrate thousand-mile masses of solid rock—so convection sets in. The rock softens, and begins to flow, carrying the heat outward by actuai motion of hot rock.

There's considerable evidence that that's happening in Earth—with drastic consequences to the surface of the planet.

Certainly the core of Jupiter must include an enormous mass of stony—and, therefore, radioactive —material. One would expect some

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powerful convective effects setting in in that vast mass of rocky stuff—and consequently in the stupendously deep and dense atmosphere of the planet. What Coriolis forces would do to convection currents trying to rise from a red-hot magma surface of 100,000 square miles or so, when the planet's atmosphere was 5,000 miles deep, and the planet rotating in a little over nine hours, is interesting to guess at. It would not be interesting to tangle with.

But Mars and the Moon . . . ? Perhaps conduction alone is sufficient to carry away their radioactive heat. The result would be a tremendously lessened dynamism of the surface. Features imposed on that surface a billion years ago could remain unchanged.

Earth, however, has such powerful internal dynamism that the ocean beds are nowhere more than 400,000,000 years old.

One of the most interesting areas of Earth, geologically, is the Canadian Shield—by far the largest continuous area of exposed precambrian rocks. It's old—two billion years and more. The Laurentian Mountains are the age-gnawed stubs of one of Earth's earliest great mountain ranges. In their day—two billion years gone, now—they outclassed the Himalayas and the Andes.

Because the Canadian Shield has been stable for such an immense period of time, it has retained, where men can get at them, the impress of astroblemes over immense spans of time. There are strong indications that the Sudbury nickel-cobalt-copper-platinum mines in Ontario are the result of a giant meteor impact 1.7 gigayears ago—an astrobleme comparable in magnitude to the more recent (250 megayear) Vredevoort astrobleme. There's suspicion that the great, essentially circular "drowned crater" of Hudson's Bay is, actually, an even larger astrobleme.

But the dynamism of Earth's internal forces, and the enormous erosive powers of wind, water, and ice rapidly eliminate any features of Earth's surface. Even the continents are unstable, drifting, shifting, rising and sinking, quivering and swinging around on the deep magma currents. The orientation of bits of magnetic materials deposited in old sedimentary rocks shows that either the magnetic poles have departed from their position near the polar axis of rotation by many thousands of miles—or that the continental rocks have!

Judging what we expect planets-in-general to be, from the exceedingly specialized information we get from studying the Earth, is—it becomes constantly more evident—a major error.

We *don't* know what a planet is like, just because we live on one. Any more than an Eskimo or a Samoan knows what climate is like, because he lives in one.

The Editor

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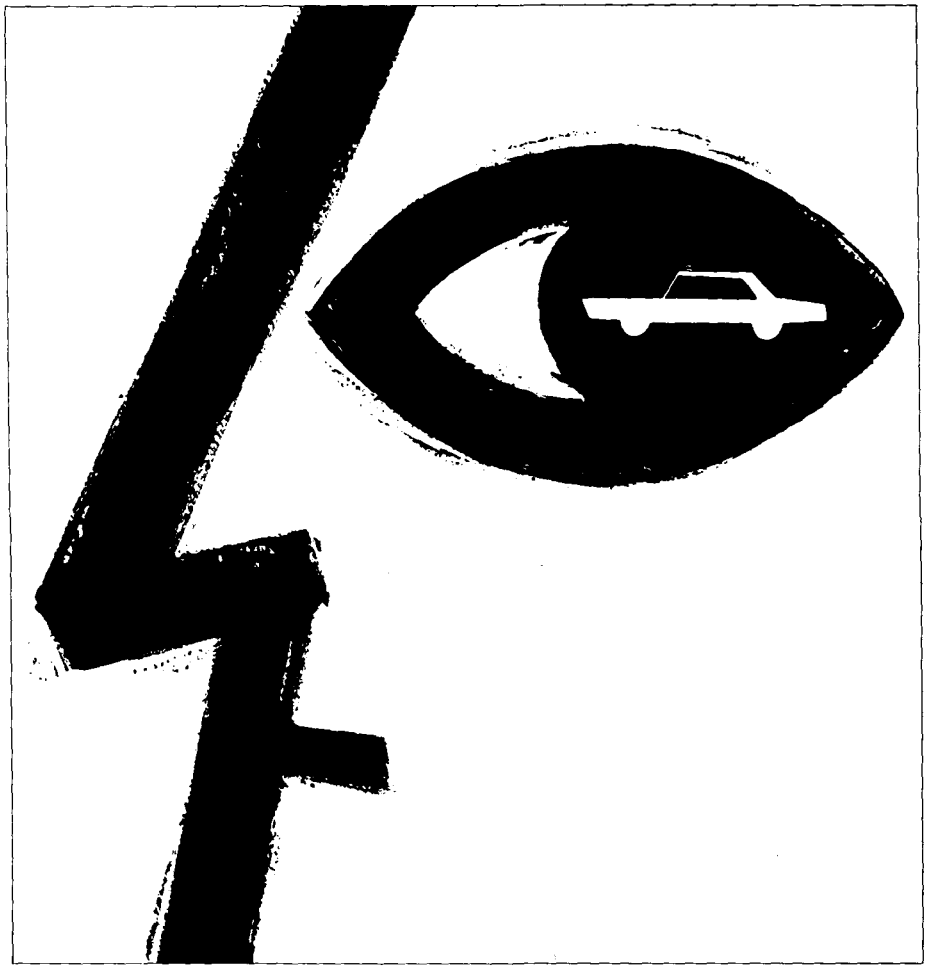

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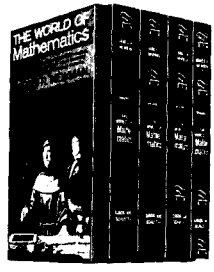

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